

Modoc County

General Plan

NATURAL

RESOURCE

ELEMENTS

Conservation

Open Space

Recreation

80 08175.2

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RESOLUTION NO. 74-33

RESOLUTION OF THE BOARD OF SUPERVISORS OF THE COUNTY OF MODOC, STATE OF CALIFORNIA, ADOPTING THE REVISED CONSERVATION, OPEN SPACE AND RECREATION ELEMENTS OF THE MODOC COUNTY GENERAL PLAN.

WHEREAS, the Modoc County Planning Commission by their Resolution No. 74-4, passed and adopted on the 13th day of May, 1974, and a copy attached hereto and made a part thereof, adopted the proposed revision to the Conservation, Open Space, and Recreation Elements of the Modoc County General Plan, recommend that the Modoc County Board of Supervisors approve and adopt said revision, and

WHEREAS, the Modoc County Board of Supervisors held a public hearing on June 3, 1974, after due notice, to receive comments on the proposed revision and the enclosed Environmental Impact Report, and at which time all interested persons were afforded opportunity to be heard thereof, and no opposition was expressed.

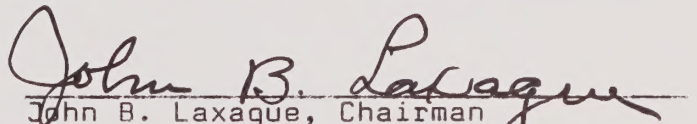
NOW, THEREFORE, BE IT RESOLVED, by the Board of Supervisors of Modoc County, that the revisions to the Conservation, Open Space, and Recreation Elements of the General Plan be hereby adopted and made a part of the General Plan for Modoc County.

Ordered on motion of Supervisor Weber and seconded by Supervisor Haas the foregoing Resolution was passed and adopted by the Modoc County Board of Supervisors on the 3rd day of June, 1974, by the following vote, to wit:

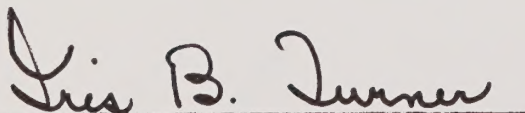
AYES: Supervisor Weber, Haas, Flourney, Cushman, Laxague.

NOES: None.

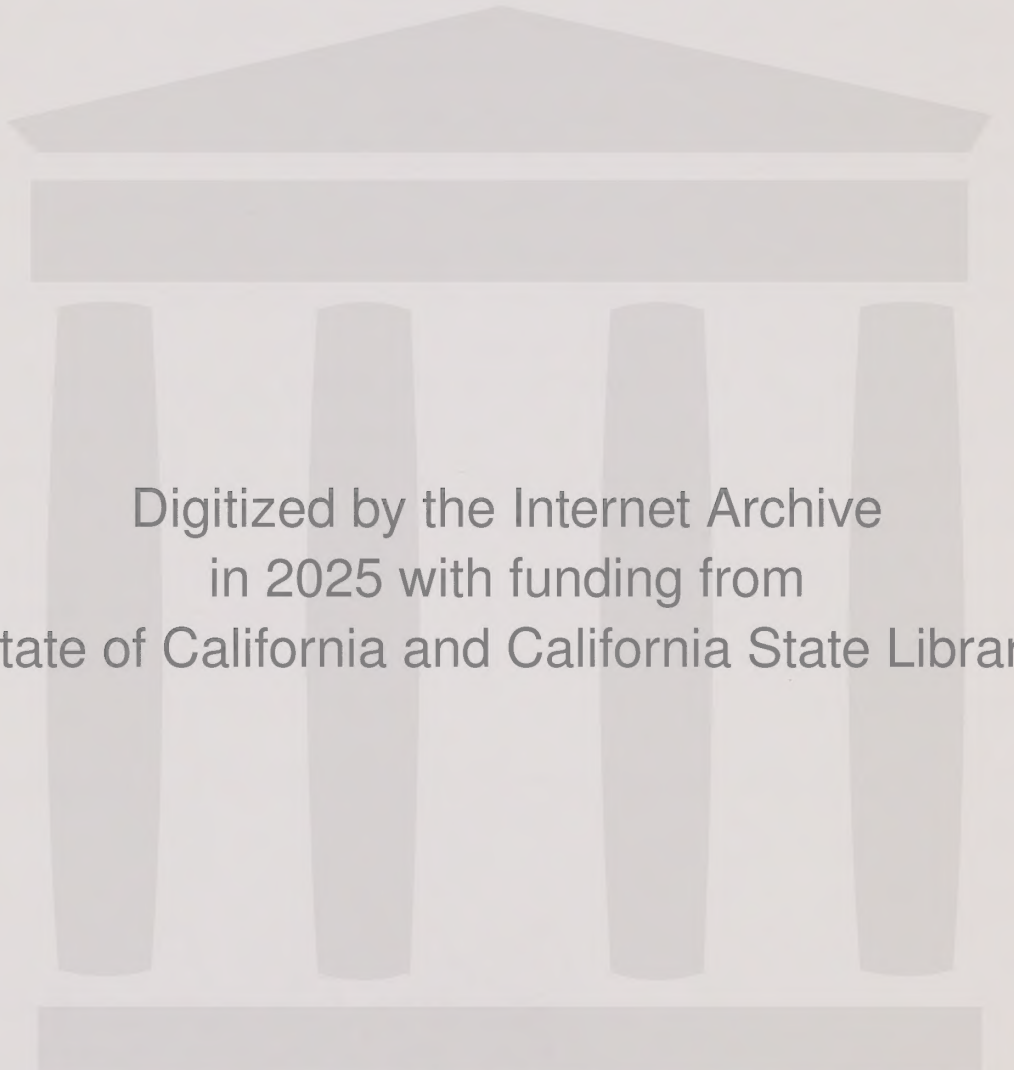
ABSENT: None.


John B. Laxague, Chairman
Modoc County Board of Supervisors

ATTEST:


Iris B. Turner, County Clerk and
Ex-Officio Clerk of the Board of
Supervisors, County of Modoc,
State of California.





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RESOLUTION NO. 74-4

RESOLUTION OF THE PLANNING COMMISSION OF THE COUNTY OF MODOC
RECOMMENDING THE ADOPTION OF THE REVISED CONSERVATION, OPEN
SPACE AND RECREATION ELEMENTS OF THE MODOC COUNTY GENERAL PLAN

WHEREAS, the Modoc County Planning Commission has held a public hearing, after due notice, to determine the merits of the revisions of the Modoc County General Plan as revised by the Modoc County Department of Public Works, a copy of the Notice of Public Hearing is annexed hereto, marked "EXHIBIT A", and made a part hereof as if set forth haec verba, and

WHEREAS, a public hearing was duly advertised and conducted to entertain the expressions of the citizens of Modoc County to such a proposal, and whereas no opposition was expressed, and

WHEREAS, the Government Code of the State of California, and more particularly Article 5, Section 65300, provides that "Each planning agency shall prepare, and the legislative body of each county and city shall adopt, the comprehensive, long-term general plan for the physical development of the county or city, and of any land outside its boundaries which, in the planning agency's judgment, bears relation to its planning", was approved and adopted on March 15, 1966, by Board Resolution No. 66-22, and

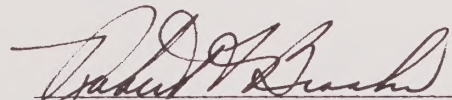
WHEREAS, the Modoc County Planning Commission, as required by law, has reviewed the Modoc County General Plan and feels that the elements enumerated therein be revised and added, and

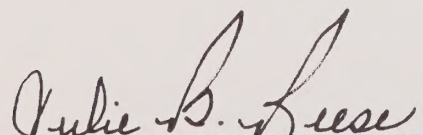
WHEREAS, the Modoc County Planning Commission, after having made a thorough investigation into the facts and circumstances surrounding the proposed revisions does ascertain that the adoption of said revisions will be in the best interests of the inhabitants of Modoc County.

NOW, THEREFORE, BE IT RESOLVED, that the Modoc County Planning Commission does recommend that the Modoc County Board of Supervisors adopt the proposed revisions to the Conservation, Open Space and Recreation elements of the Modoc County General Plan as set forth in the document titled "Natural Resources Elements", affixed hereto marked "EXHIBIT B" and incorporated herein as if set forth haec verba.

On motion of Commissioner Harris and seconded by Commissioner Weber, the above and foregoing Resolution was passed and adopted by the Modoc County Planning Commission on the 13th day of May, 1974, by the following vote, to wit:

AYES: Commissioners Harris, Weber, Dalton, Brown, Brooks
NOES: None
ABSENT: None


Robert F. Brooks, Chairman
Modoc County Planning Commission


Julie B. Reese, Secretary
Modoc County Planning Commission

RESOLUTION NO. 74-11

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ALTURAS, COUNTY OF
MODOC, STATE OF CALIFORNIA, ADOPTING THE REVISED CONSERVATION,
OPEN SPACE AND RECREATION ELEMENTS OF THE MODOC COUNTY GENERAL PLAN
AS A PART OF THE CITY OF ALTURAS GENERAL PLAN

WHEREAS, The City of Alturas Planning Commission at its meeting of
25 day of June 1974 did review the proposed
revision to the Conservation, Open Space and Recreation
Element to the Modoc County General Plan and did recommend
that the City Council adopt said revision as a part of the
City of Alturas General Plan, and

WHEREAS, The City Council did on the 8th day of July,
1974, hold a public hearing for the purpose of considering
the above, and notice thereof having been given as prescribed
by law and at which time all interested persons were offered
opportunity to be heard thereon and no opposition was expressed.

NOW, THEREFORE BE IT RESOLVED, that the revisions to the Conservation,
Open Space and Recreation Elements of the Modoc County General
Plan be hereby adopted as a part of the City of Alturas General
Plan.

PASSED AND ADOPTED by the Alturas City Council on the 8th day of
July, 1974 by the following vote:

AYES: Councilmen : Paul Breshears, Sigurd Sonnevill, James Porter
Neal Phillips

NOES: None

ABSENT: Councilman Dal Dodge

ATTEST: Lyle P. Fountain
City Clerk of the City of Alturas

Neal Phillips
Mayor of the City of Alturas

RESOLUTION OF THE PLANNING COMMISSION OF THE CITY OF ALTURAS, COUNTY OF MODOC, STATE OF CALIFORNIA, RECOMMENDING THE ADOPTION OF THE REVISED CONSERVATION, OPEN SPACE & RECREATION ELEMENTS OF THE MODOC COUNTY GENERAL PLAN AS A PART OF THE CITY OF ALTURAS GENERAL PLAN

WHEREAS; The City of Alturas Planning Commission has reviewed the Revised Conservation, Open Space & Recreation Elements of the Modoc County General Plan, and

WHEREAS; A Public hearing was duly advertised and was conducted on the 25th day of June, 1974, to afford an opportunity for public comment and no opposition was expressed, and

WHEREAS; The City of Alturas Planning Commission did determine that the public interest would be served by the adoption of said revisions,

NOW, THEREFORE BE IT RESOLVED, that the City of Alturas Planning Commission recommends that the Alturas City Council adopt as a portion of the City of Alturas General Plan, the revisions set forth in the document titled "Natural Resources Elements", attached hereto.

On the motion of Commissioner Young and seconded by Commissioner Ash, the foregoing resolution was passed and adopted by the City of Alturas Planning Commission.

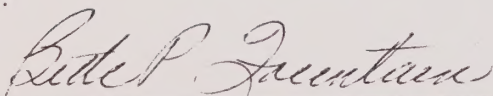
AYES: Pat Ash, Marty Young, Chic Keeney

NOES: None

ABSENT: Richard Phillips, Dick Pyle


Chairman, City Planning Commission

ATTEST:


Secretary, Alturas Planning Commission

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I N T R O D U C T I O N

The "Natural Resource Elements" supplements the Modoc County and City of Alturas General Plans in the areas of Conservation, Open Space and Recreation. The Conservation and Open Space Elements are required by Government Code Sections 65302(d) and 65302(e) respectively.

The first three sections of the document contain the plan elements. The potential impact these elements may have on the environment is discussed in the fourth section. The fifth section is an appendix, containing up to date maps, resource data and discussions and recommendations concerning the various aspects of our natural resources. This section is the basis for the policies and actions outlined in the "Natural Resource Elements".

GOALS AND OBJECTIVES

The goals stated in the Modoc County General Plan provide the basic framework within which this document was prepared. These goals are:

1. To make Modoc County a more desirable place in which to live, work and play.
2. To encourage population growth.
3. To establish a greater variety and dispersion of employment opportunities.
4. To protect the agricultural areas from encroachment of incompatible uses.
5. To conserve and develop the natural resources so that they can be used for today's enjoyment and still be retained for future generations.
6. To preserve the natural beauty and recreational assets of the county.
7. To attract a greater share of the tourist industry.

The Natural Resource Elements will aid in achieving these goals.

ENVIRONMENTAL IMPACT REPORT ON THE NATURAL RESOURCE ELEMENTS OF THE MODOC COUNTY AND CITY OF ALTURAS GENERAL PLAN

DESCRIPTION OF PROJECT

The portion of the project described in the Conservation Plan consists of policy statements relating to various phases of resource use in Modoc County.

The portion of the project described in the Open Space Plan consists of general statements regarding how open space requirements are being met in Modoc County. It has been determined that the existing land use element and zoning ordinance provide for adequate open space to meet the needs at the present time and as far into the future as we can look. The plan proposes no new actions or changes.

The portion of the project described in the Recreation Plan consists of a number of actions planned to meet the foreseeable recreational needs of the county.

ENVIRONMENTAL SETTING

The general environmental setting is described in detail in the Resources section of the "Natural Resource Elements". Individual sites where construction is proposed in the Recreation Element cannot be described because they have not been precisely identified at this time.

ENVIRONMENTAL IMPACT

The policies outlined in the Conservation Plan were designed to be beneficial to the environment. Development would be guided to areas where the least environmental impact would occur.

The plan proposes no construction work or other changes in regime that would directly effect the environment.

Adverse effects are mostly social and economic, not environmental. These effects include: restriction in allowable uses of certain areas; increased costs involved in the use of recommended techniques; infringement on personal property rights. The policy of assigning a high priority to the agricultural use of water might result in decreased streamflows, which may have a detrimental effect on water quality downstream.

The major impact of the Open Space Element is to provide an inventory of the open space areas in the county and to outline the provisions that have been made for the maintenance of these areas.

The positive impacts of open space are so well understood that it is not considered necessary to describe them in this report.

The negative impacts are social and economic, not environmental. These impacts include: the limitation of land available for other purposes; limitations placed on economic growth; limitations to personal property rights; and restrictions imposed on the tax base.

Adverse effects which cannot be avoided:

None of the negative impacts, listed above, can be completely avoided if the open space policy is strictly carried out.

The projects proposed in the Recreation Element would improve the recreational opportunities available to local people and to visitors. The various areas involved would receive increased traffic and use and would suffer the effects of these increases. Construction activities would disturb the soils and vegetation on parts of some sites. The new facilities would improve sanitation conditions on some areas now receiving use and would provide sanitary facilities in areas where none presently exist. Aesthetic values will be improved in some cases by repairing or replacing building and by cleanup and maintenance activities.

The main unavoidable effect would be the increased use of the areas involved. This may cause increased traffic, littering, parking and other problems.

Another unavoidable effect would be the destruction of the vegetation on building sites, and the removal of the possibility of using the site for other purposes.

MITIGATING MEASURES

Mitigation of the adverse effects of the Conservation and Open Space Elements would be provided by judicious use of conditional use permits, zoning changes, general plan changes and other suitable means.

The impact of the proposals in the Recreation Element will be reduced by adhering to good engineering and conservation principles in design and construction of the facilities.

ALTERNATIVES

The alternatives chosen in the Conservation Plan were those which would, in our opinion, do the most toward protecting the resources while causing the least economic or social disturbance to the citizens of Modoc County. Other alternatives would force changes which would be unacceptable to the public and/or might cause environmental damage.

The alternative of developing a more comprehensive open space plan and zoning ordinance was not chosen because we have determined that there is more than sufficient open space in the county for foreseeable needs and that our existing policies and procedures are adequate to preserve the needed areas.

The alternative of no project is not valid in these two cases because the Conservation and Open Space Elements are mandated by state law.

In some cases, alternate recreational sites will be identified. Efforts will be made to choose sites where the least impact will occur.

The alternative of no project would leave us without a plan for the recreational opportunities we believe are needed in the county.

RELATIONSHIP BETWEEN SHORT TERM USE AND LONG TERM PRODUCTIVITY

The Conservation and Open Space Elements are directed toward maintaining the long term productivity of the county. Short term uses that might be allowed will be considered on a case by case basis.

Most proposals included in the Recreation Plan will remove the possibility of using the site for other purposes. These proposals are for long term uses and probably are the most productive use for the site.

IRREVERSIBLE ENVIRONMENTAL CHANGES

The Conservation and Open Space Elements contain no proposals that would be irreversible and no policies that would have irreversible results.

The irreversible change caused by most proposals in the Recreation Element will be the elimination of the possibility of other uses on most sites. Sites will be chosen so that they do not involve non-renewable resources, other than the sites themselves.

GROWTH INDUCING IMPACT

The implementation of the policies in the Conservation Element would make possible some growth in our two major industries, agriculture and lumbering. Some growth may also result in the tourism industry.

Minor growth might occur in the communities to meet the needs of the major industries, but this would be directed toward existing residential, commercial and industrial areas and away from environmentally sensitive locations.

Open space tends to restrict, rather than induce growth.

The actions in the Recreation Plan could result in increased visitor use of the area, thereby creating additional trade for local businesses. It is doubtful that the proposals, either singly or taken as a group, would create the need for a significant number of new businesses.

The implementation of these proposals would make Modoc County a more desirable place in which to live. This may result in new residents moving to the county on either a year around or part year basis.

We do not have sufficient information to make an estimate of the population or visitor increases we could expect from these activities.

WATER QUALITY ASPECTS

Downstream water quality might be effected by the implementation of the policy relating to water use contained in the Conservation Element. Any action taken in furtherance of this policy and the proposals in the Recreation Plan would be subjected to the regulations of the Water Resources Control Board, the Water Quality Control Board and the California Environmental Quality Act.

The Open Space Element proposes no action that could have a detrimental effect on water quality.

ORGANIZATIONS AND GROUPS CONSULTED

Agricultural Extension Service
Bureau of Land Management
Bureau of Reclamation
Bureau of Sport Fisheries and Wildlife
California Department of Fish and Game
California Department of Water Resources
California Division of Forestry
Forest Service
Modoc County Agricultural Commissioner
Modoc County Assessor
Modoc County Chamber of Commerce
North Cal-Neva Resource Conservation and Development Project
Resource Conservation Districts: Adin-Lookout, Central Modoc, Lava Beds and Surprise Valley
Soil Conservation Service

COMMENTS RECEIVED

No comments received on Environmental Impact Review.

The CONSERVATION ELEMENT

CONSERVATION IS THE PLANNED MANAGEMENT,
PRESERVATION AND WISE UTILIZATION OF
NATURAL RESOURCES. MODOC COUNTY'S OB-
JECTIVE IN CONSERVATION IS TO PREVENT
THE WASTEFUL EXPLOITATION, DESTRUCTION
OR LOCKING UP OF ITS RESOURCES.

THE CONSERVATION PLAN

The Resources section describes and analyzes the needs for protection and development of Modoc County's natural resources. The following discussion provides the philosophy and general policy to be used for guidance in making land use decisions that may affect those resources.

AGRICULTURAL LANDS

The Agricultural Industry is Modoc's largest user of water and land. In 1970 more than \$25,000,000 in farm products were sold and nearly six hundred persons were employed on the farms and ranches in Modoc County. Agricultural related businesses and other retail establishments are dependent upon the agricultural sector to varying degrees.

Food production is an essential industry county-wide, state-wide, nation-wide and world-wide. In this era of critical energy shortages, Agriculture is one of the few industries that produces more energy (calories) than it consumes.

Agricultural lands provide open space and add scenic values to the landscape.

To meet present and future needs for food production and to preserve this important segment of the economy, it is necessary that our better agricultural lands remain in agriculture rather than being converted to other uses.

It is important that agriculture be provided with the water it needs for livestock and crop production. Only the needs of public health and safety and the protection of property and resources should have a higher priority. Wherever possible, multiple purpose use should be made of existing supplies.

An increasing portion of our agricultural and domestic water supply comes from underground sources. This supply must be replenished annually to prevent the "mining" of our water tables. Very little is known about where the groundwater recharge takes place. These areas should be located and protected against developments which will prevent water from entering the water table.

Water borne sediments are a direct result of erosion, and are the most common pollutants in our streams and reservoirs. We encourage all farmers and ranchers to follow conservation programs, such as those available through Resource (Soil) Conservation Districts, to help reduce this pollution source and to make the best use of available water.

FOREST LANDS

Lumbering is Modoc County's second largest industry in terms of land used and dollar value produced. Most present day lumbering is done on public lands, but forests make up a sizeable part of the privately owned acreage. Forest lands occur on our watershed and groundwater recharge sites and provide a significant part of our open space and scenic values.

We need to keep our prime timber sites in production to meet present and future needs for building materials, to provide employment opportunities and to help maintain the economic base of the county. Competing uses should be restricted to the poorer timber sites whenever practical.

Erosion and sedimentation, resulting from lumbering activities, can become a serious problem. We encourage all timber producers to use good management and road construction practices to prevent degradation of soil and water resources.

WILDLIFE AND FISHERY HABITAT

Game animals and fish are important users of our land, water, vegetation and open space. Recreational activities centered around hunting, fishing and viewing add to the enjoyment of the area by local people and bring many outsiders into the county each year. Adequate wildlife and fishery habitat must be available if we are to continue to enjoy these values.

Private land owners, federal land administering agencies and land users need to give consideration to the development and maintenance of food, cover, migration routes, breeding areas and other habitat factors when they are planning or installing modifications to land, water or vegetative resources.

RECREATIONAL LANDS

Recreation is becoming an increasingly significant use of our land, water and other resources. Facilities for this use are compatible with most other uses if they are properly planned and carried out. Primary consideration in selecting recreation areas should be given to:

- Minimum interference with agricultural lands or activities and wildlife habitat;
- Protection of site and adjacent areas from soil erosion;
- Prevention of water pollution;
- Protection of historical sites, archeological sites and rare or endangered plant and animal species.

RESIDENTIAL AREAS

Adequate and desirable building sites are essential if the population of the county is to grow. Primary considerations in the location, planning, approval and construction of residential and recreational subdivisions are:

- Minimum infringement upon good agricultural lands, forest lands, groundwater recharge areas or wildlife and fishery habitat;

- Maximum use of good engineering and conservation principles to avoid degradation of soil and water resources;

- Avoidance of historical sites, sites with archeological significance and habitat for rare or endangered plant or animal species.

LANDS FOR COMMERCIAL, INDUSTRIAL, TRANSPORTATION AND PUBLIC UTILITIES

Sites for the above purposes are essential to the economic activity of the county. Suitable areas can be made available, but careful attention must be paid to the environmental aspects of these uses. Primary considerations in the location, planning, approval and construction of these facilities are:

Minimum infringement upon good agricultural lands, forest lands, groundwater recharge areas and wildlife and fishery habitat;

Maximum use of good engineering and conservation principles to avoid degradation of soil and water resources;

Avoidance of historical sites, sites with archeological significance and habitat for rare or endangered plant or animal species;

Choosing locations where noise, odors, radiations or other disturbances will not affect residential, recreational, wildlife or other uses;

Provisions of adequate facilities for the safe, ecologically acceptable disposal of emissions, effluents and waste materials.

The Conservation Plan map, following page, shows the uses that are generally most compatible with the conservation needs of the various delineations. These are not the only uses that are permissible in most cases and we encourage multiple or alternative use wherever it can be installed without environmental damage. The intensity of mapping and planning does not permit the establishment of firm boundaries between allowable uses nor the identification of isolated areas within larger delineations. The environmental review procedure adopted by the county requires the consideration of specific individual cases and will help provide for the protection and maintenance of our natural resource values.

IMPLEMENTATION OF THE CONSERVATION PLAN

Various tools are available for use in putting the plan into practice. The ones that appear to be most applicable to Modoc County are:

EDUCATION

Public awareness and acceptance are key factors in carrying out the Conservation Element of the General Plan. The people must understand what needs to be accomplished and why it is important. Many groups and agencies have given and are giving a great deal of help in making people aware of these needs. We commend them for their past efforts and urge them to continue the good work.

ZONING

Zoning is one of the more effective means of guiding the uses of land. It is not a popular action because it places community rights and values above the individual's right to treat his property as he wishes.

Zones that can help accomplish conservation purposes are: Agricultural District-Forest, General Agricultural District, Exclusive Agricultural District, Open Space, Conservation and Grazing District, Flood Combining Districts.

SUBDIVISION REGULATIONS

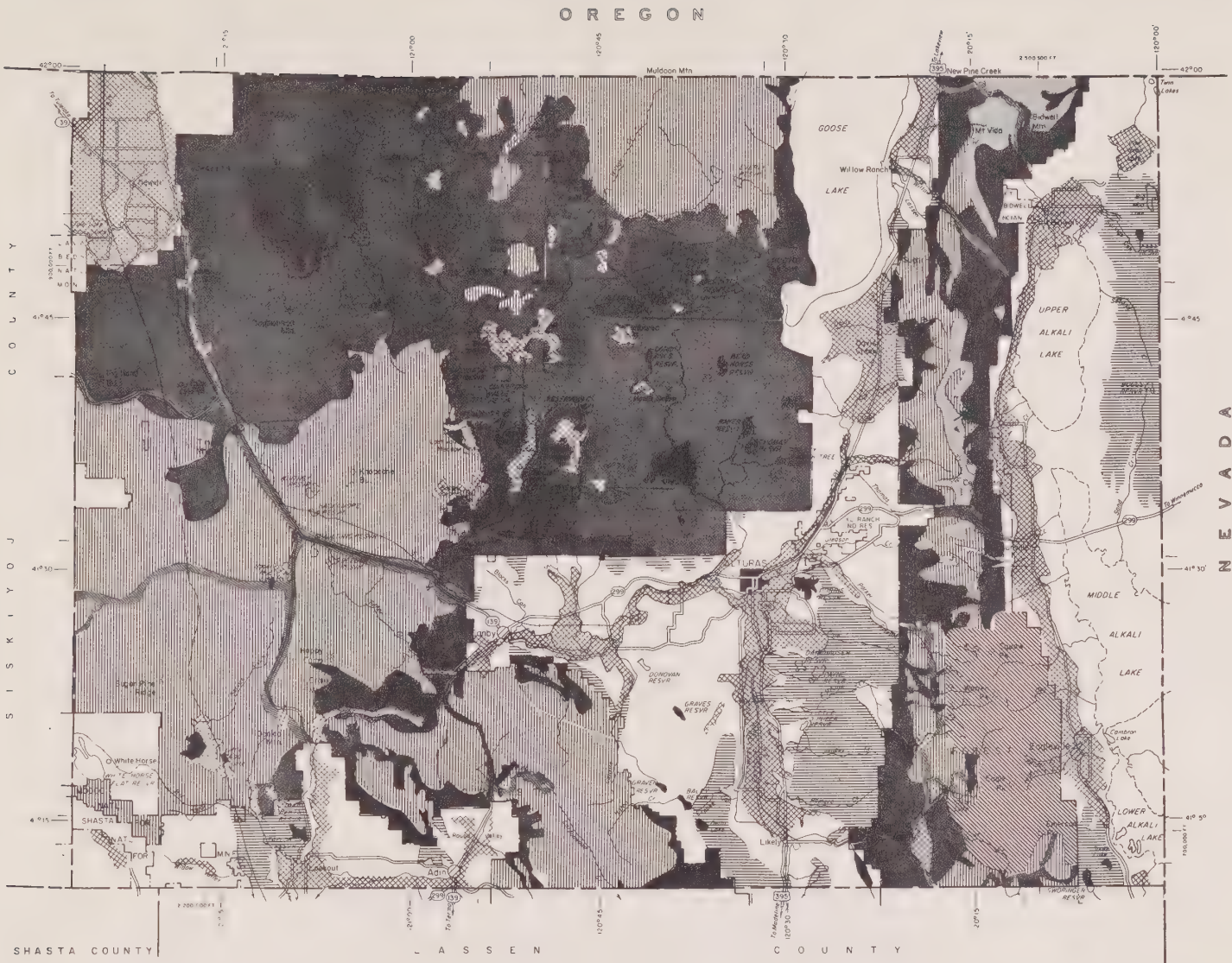
Subdivision regulations provide guidance to developers and set up review procedures to assure that subdivision proposals adequately consider conservation and environmental factors in the planning, design and construction phases.

OTHER ORDINANCES

The county has broad authority to adopt ordinances to promote the public health, safety, morals and general welfare. Examples of ordinances that might apply to the Conservation of Natural Resources include: Drainage, Grading, Pesticide, Weed Control, Road Construction and many others.

ENVIRONMENTAL IMPACT REVIEW PROCEDURE

Whenever the county adopts an ordinance, issues a permit, approves a variance, gives tentative approval to a subdivision or carries out any act that might have a significant effect on the environment, an environmental analysis must be made. This procedure insures that the resource conservation aspects of any job are considered before final action has been commenced.



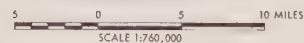
CONSERVATION PLAN MAP

- Agriculture - Extensive and intensive Crop and Livestock Production
- Commercial Timber - Commercial Timber Production
- Non Commercial Timber - Livestock Grazing, Wildlife Habitat
- Range Land - Livestock Grazing, Other
- Crest - Watershed
- Recharge - Ground Water Recharge and Livestock Grazing
- Water Influence Areas - Recreation
- Travel - Recreation
- Special-Wilderness & Natural Areas

The areas shown on the Conservation Plan Map have characteristics which make them particularly valuable for the purpose or purposes indicated. Other compatible uses of these areas are encouraged to realistically balance the environmental and economic needs of the county.

CONSERVATION PLAN MODOC COUNTY CALIFORNIA

DECEMBER 1973



The OPEN SPACE ELEMENT

OPEN SPACE IS NEEDED FOR THE CONSERVATION
OF NATURAL RESOURCES, THE MANAGED PRODUCTION
OF RESOURCES, PUBLIC HEALTH AND SAFETY AND
OUTDOOR RECREATION.

THE OPEN SPACE PLAN

The basic needs for open space in Modoc County are being met by the vast area and sparse population of the county. Approximately 8,000 people share 4,237 square miles. Unless a tremendous, unpredicted increase in population occurs, or unless new needs are identified, the existing open space areas should be more than adequate for years to come.

The Land Use Element of the General Plan and the zoning ordinance establish standard categories with specific allowable uses.

The *Open Space, Conservation and Grazing District* covers more area than any of the other zones. Uses that conflict with the Open Space purpose are not allowed in this zone. Most of the land within this zone is federally owned.

The *Agricultural District-Forest*, *Exclusive Agriculture District* and the *General Agriculture District* permit only those uses that are compatible with open space. Minimum lot size is three acres in the *General Agriculture District* and forty acres in the other two. Most of the land in the *Agricultural District-Forest* is federally owned.

In the *Unclassified District* uses that might conflict with open space are allowed only upon the issuance of a use permit, or upon the approval of a subdivision. Minimum lot size is three acres.

The *Rural Residential District* requires a minimum lot size of three acres unless an approved community water or sewer system is available. Many authorities consider areas having a three acre minimum lot size to be "Open Space".

The *Commercial District* and the *Industrial District* occur only in the immediate vicinity of the City of Alturas and the other towns and villages in the county. However, Alturas does have open space within the city limits in the county park, the school athletic field and play areas and the youth park.

The *Flood Combining Districts* are zones that may be placed upon other zones to prevent the obstruction of flood flows and to prevent the loss of life and property.

The areas included in commercial, industrial and heavy residential districts cover about seventy square miles - less than 2% of the county's total land area.

Identified hazardous areas have not been used for other than open space to date, except for some construction in flood prone areas. We have adequate authorities to limit future conflicts.

The Open Space Plan map, following page, delineates general areas where open space zoning has been established. The scale of the map does not permit precise delineation of boundaries or location of specific parcels of land. Readers requiring precise information should consult the zoning map in the Planning Department office.

The City of Alturas Open Space map shows existing and proposed open space areas within and immediately adjoining the city.

IMPLEMENTATION OF THE OPEN SPACE PLAN

The tools and safeguards available for maintaining adequate open space in Modoc County are:

ZONING

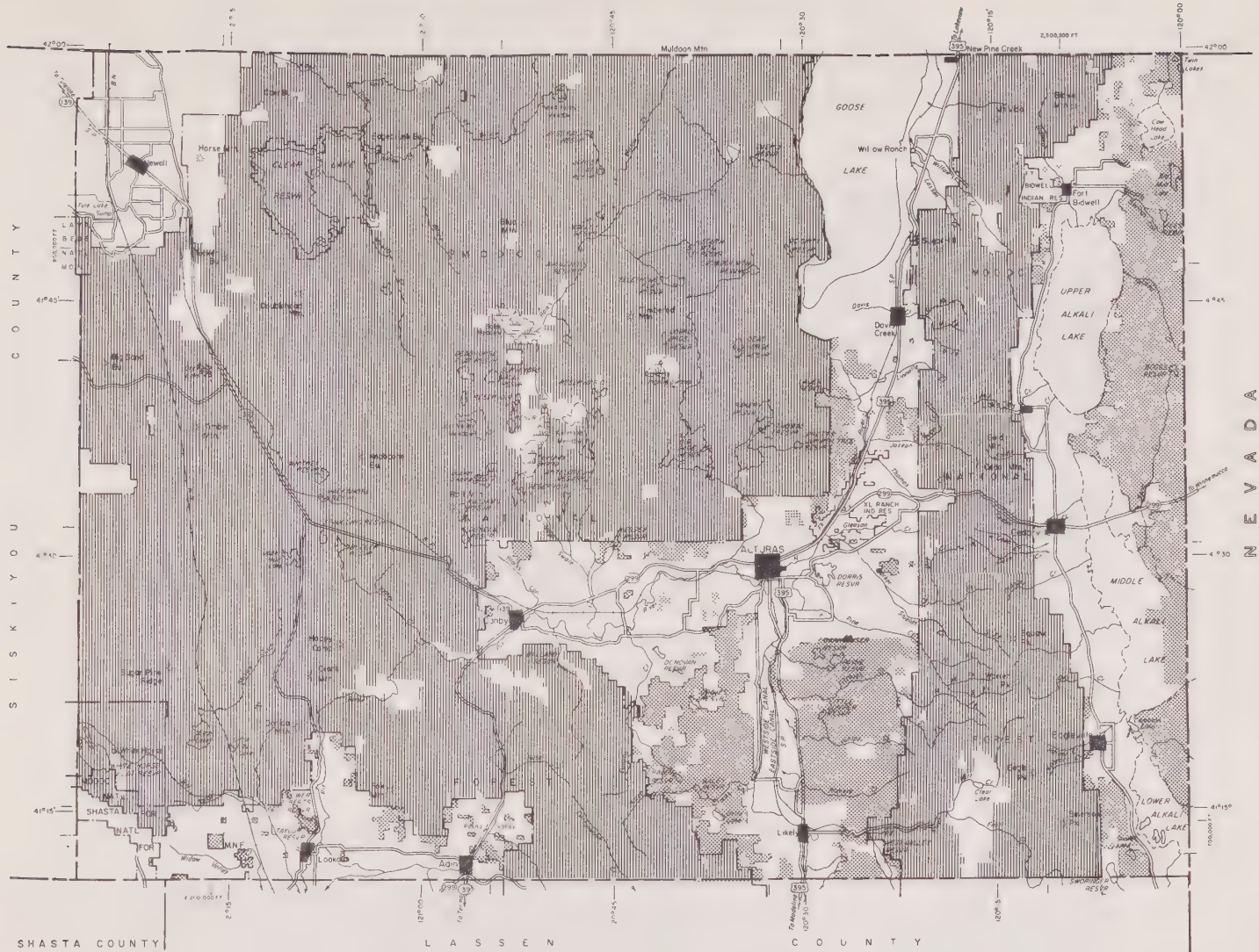
The present zoning, in conjunction with the new required open space zoning ordinance will provide for any presently identified needs.

ENVIRONMENTAL IMPACT REVIEW PROCEDURE





The environmental, growth inducing and other impacts must be analyzed before any subdivision, variance, zoning change or special use permit can be approved. This will assure that open space needs are considered in development requiring authorization.

PUBLIC LANDS

Public land agencies administer the largest areas of open space in the county. Any major changes on these lands must be subjected to full environmental review prior to action.



OPEN SPACE MAP

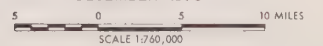
-  Open space lands, largely controlled by U.S. Forest Service or Park Service
-  Open space lands, largely controlled by Bureau of Land Management.
-  Urban and Built up areas
-  Other non-open space areas & lakes

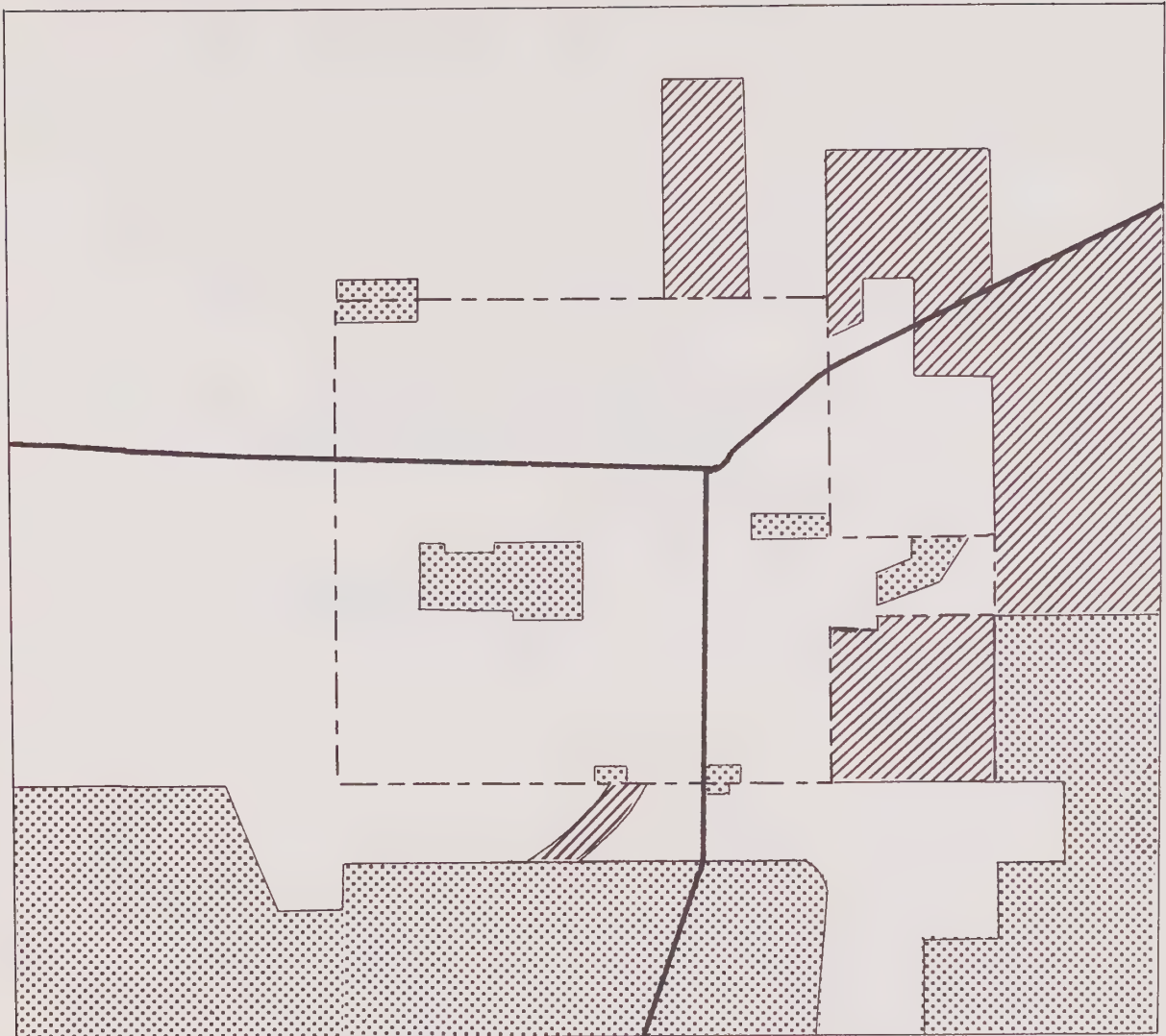


This map is intended to show the magnitude and general pattern of open space areas in Modoc County. At this scale the location, size and shape of properties not in an open space zone can only be approximate. Readers interested in particular parcels are referred to the Modoc County Zoning Maps.

OPEN SPACE MODOC COUNTY CALIFORNIA

DECEMBER 1973










**OPEN SPACE
MAP**
CITY of ALTURAS
And Surrounding Area



Approx. Scale
1" = 3,000'

LEGEND

-  Used for Open Space Purpose
-  Zoned for Open Space Use
-  Other than Open Space

-  Alturas City Limits
-  State Highway

Prepared by
MODOC COUNTY
DEPARTMENT OF PUBLIC WORKS
May, 1974

The RECREATION ELEMENT

RECREATION HELPS FILL MAN'S LEISURE HOURS
AND TAKES HIS MIND FROM THE PRESSURES AND
UNCERTAINTIES OF TODAY'S FAST MOVING SOCIETY.

RECREATION ELEMENT

Modoc County is an area of many and varied outdoor recreational opportunities. A constantly increasing number of tourists visit our county to share our clean air and freedom from congestion. A sampling of activities available and a discussion of improvements that could be developed is listed below.

Backpacking and Hiking:

Nearly 200 miles of trails are available to the hikers, with trips ranging from a few hours to several days. The South Warner Wilderness Area is probably the most popular and rugged. It rewards the hiker with exciting views and a seclusion that is marred only by an occasional aircraft flying overhead. Other, less demanding trails are available in the Warner Mountains.

If this activity continues to increase in popularity, there will be a need for the development of additional trails, semi-primitive campsites with at least toilet facilities and drinking water, where this is compatible with land use policies, and some developed campsites at various trail heads. Practically all of the trails are on National Forest lands and are the responsibility of the Forest Service to construct and maintain. There are some opportunities to develop trail head campsites on privately owned land. This could be a private venture or land might be obtained by the county from the Forest Service for this purpose.

Bicycling:

Bicycle riding is gaining in popularity throughout the state and Modoc County is no exception. Participation in this activity may develop to the point where it will become necessary to provide bike trails and other facilities for riders.

Bird Watching:

Opportunities for this activity are available at the three federal wildlife refuges and at many of the lakes and reservoirs throughout the county.

Camping and Picnicking:

Table 1 on page R-2 is a tabulation of existing and proposed camp and picnic areas in Modoc County or in adjacent areas. The map on page R-3 shows the approximate location of these campgrounds. During most of the year, these facilities are quite adequate to handle the number of people desiring to use them. Deer hunting season, however, brings large numbers of people to the county and the established sites cannot begin to cope with the load. Some additional campsites are being considered for development by the Forest Service, but fund limitations have brought this activity nearly to a standstill. The Bureau of Land Management has long range plans to provide a series of hunter camps and developed campgrounds. There are many potential areas on private land that could be developed to relieve this load and perhaps provide business opportunities for local people.

The county has developed community parks in Adin, Alturas, Cedarville and Newell. The need for picnic and park facilities could be filled by 'village greens' or mini-parks in the other communities of the county. The 'village greens' could also serve as rest stops for tourists.

TABLE 1 - CAMPGROUNDS AND PICNIC FACILITIES

NAME	Map Sym- bol	Operated By	EXISTING			PROPOSED		
			Tent	Tent or Trailer	Picnic	Tent	Tent or Trailer	Picnic
Fee Reservoir	A	County		6				
Lower Roberts Reservoir	B	County				10		
West Valley Reservoir	C	County	6	6		12	12	12
Dorris Reservoir	D	BSF&W			12			
Allen Camp Reservoir	E	USFS				198		99
Badger Wells	F	USFS				5		
Big Sage Reservoir	G	USFS	5	5	4			5
Cave and Lily Lakes	H	USFS	14	9	12			
Cedar Pass - East	I	USFS				10		
Cedar Pass - West	J	USFS	3	15				
Cottonwood Flat	K	USFS	10					
Crowder Flat	L	USFS				5		
Emerson	M	USFS				10		
Howard's Gulch	N	USFS	5	6				
Lava	O	USFS	12					
Mill Creek Falls	P	USFS	10	10		9		
Patterson	Q	USFS	12					
Pepperdine	R	USFS				8		
Plum Valley	S	USFS	6					
Quaking Aspen	T	USFS				5		
Rush Creek - Lower	U	USFS	5	1	13			
Rush Creek - Upper	V	USFS	11					
Soldier Creek	W	USFS				10		5
Soup Springs	X	USFS	5	5				
Stowe Reservoir	Y	USFS	5			5		
Lassen Co., Blue Lake	Z	USFS	10	38				

COUNTY PARKS

a - Adin
b - Alturas
c - Cedarville
d - Newell

PROPOSED VILLAGE GREENS

e - Canby
f - Davis Creek
g - Eagleville
h - Fort Bidwell
i - Lake City
j - Likely
k - Lookout
m - New Pine Creek

Fair:

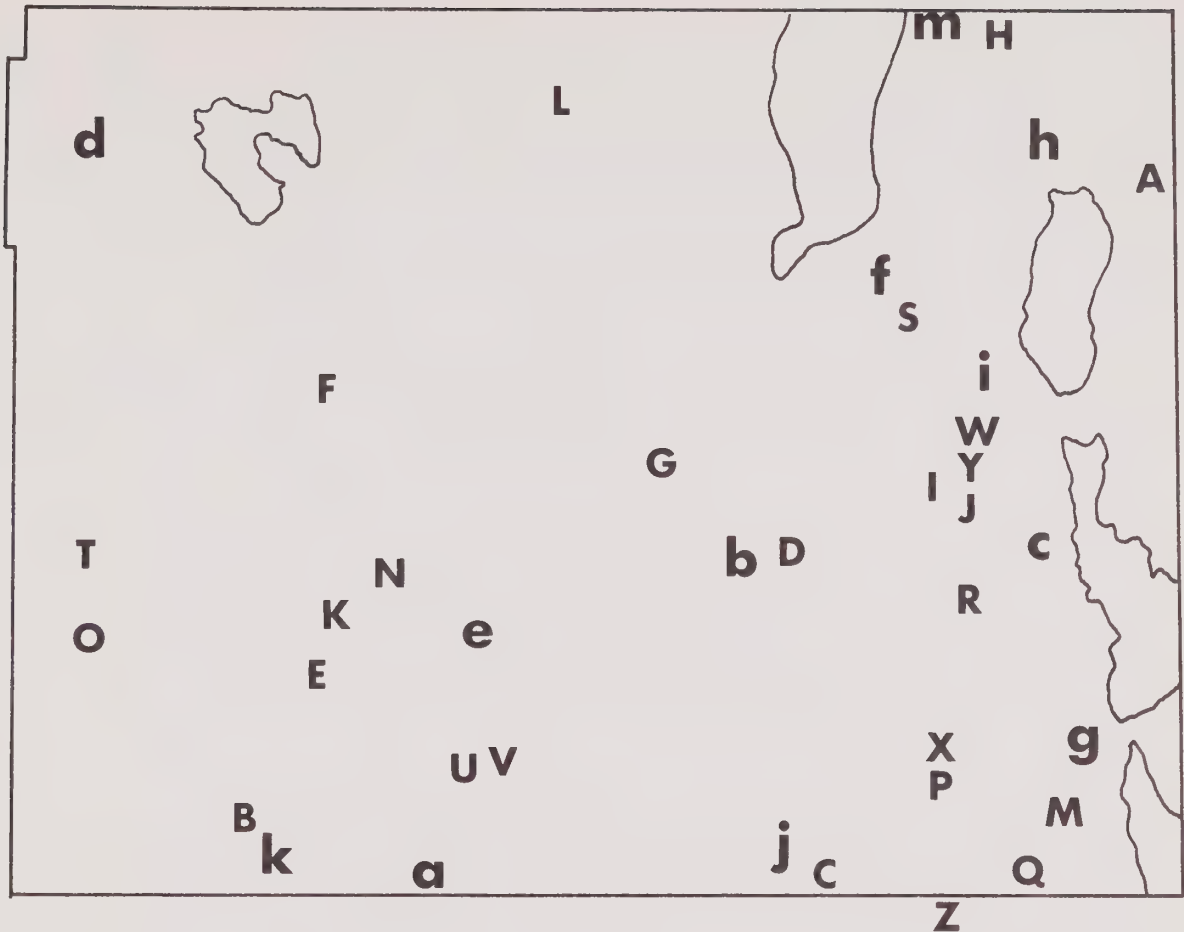
The Modoc County Fair, held in Cedarville each year, provides entertainment for both county residents and visitors. Included in the activities are various exhibits, a rodeo, horse show and stage show. The fairground facilities are available for recreational and other activities through the rest of the year.

Fandango Days:

This annual 4th of July celebration, held in Alturas, features a parade, frog jumping contest, junior rodeo, boat show and races, trap shooting and horseshoe pitching contest.

Fishing:

Modoc County features both warm water stream and lake fishing. Fisheries are treated in detail in the Resource section (starting on page 85) and principal fishing lakes are located on the Recreation map. Frogging is a similar sport that is



EXISTING AND PROPOSED CAMPGROUNDS
(SEE TABLE 1)

quite popular in Modoc, with several species available for enthusiasts.

Historical Site Visiting:

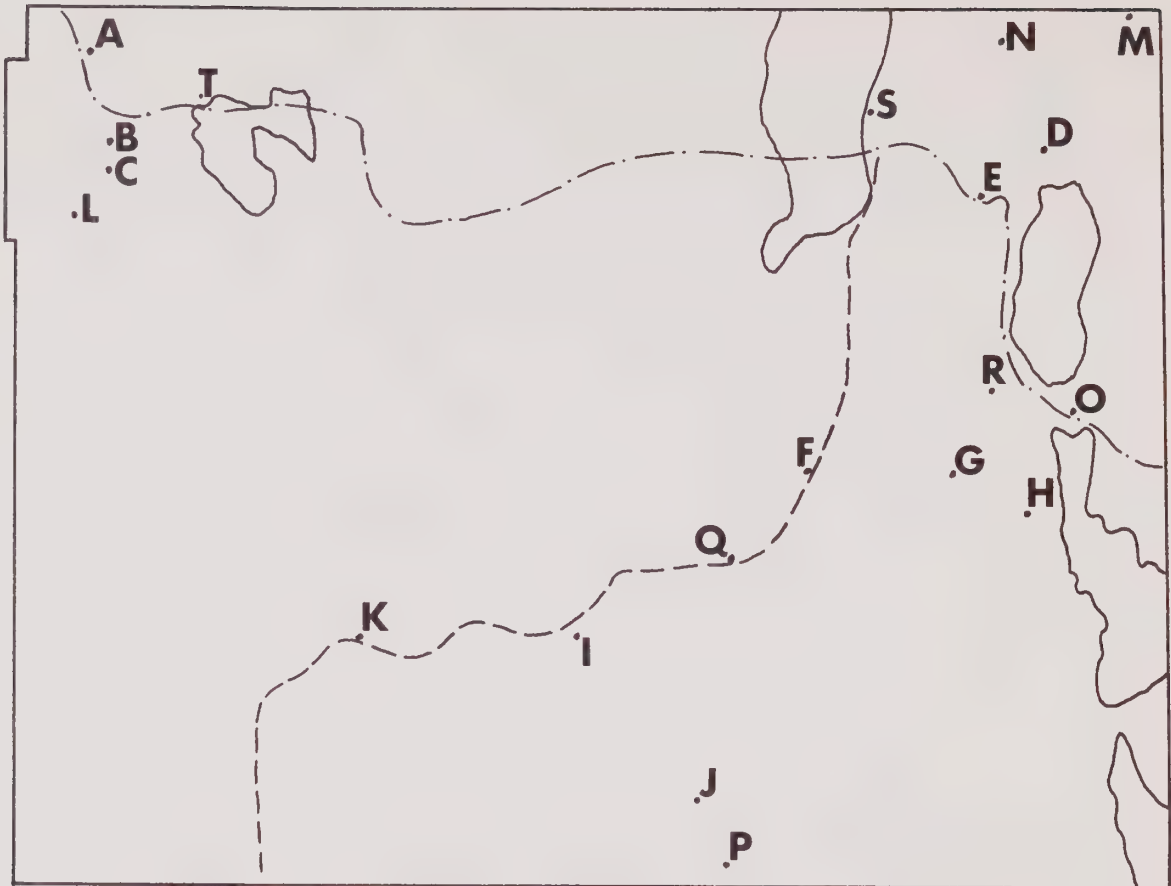
Modoc's past has been colorful and interesting. Tourists and local people alike spend many pleasant hours in the Modoc County Museum reviewing the collection of antiques and artifacts. The collection is fast outgrowing the present quarters and more adequate space should be provided.

Some of the significant sites are listed below and are located on the Historical Sites map on page R-4. Many of these sites, and probably others we have overlooked, should be marked, protected or restored so future generations can enjoy and learn from them.

Historical Sites List; Keyed by Letter to Historical Sites Map:

Bloody Point (A):

Registered State Historical Landmark No.8. This was the scene of several massacres of emigrants on the Applegate Trail in the early 1850's. Located 3.5 miles south of Oregon state line on Malin Road. Unmarked.



HISTORICAL SITES MAP

LEGEND

- .-.- Approximate Route of Applegate Trail
- Approximate Route of Lassen Trail
- A Location of Historical Site (See Text)

Fremont's Camp (B):

Registered State Historical Landmark No.6. Historical evidence shows that John C. Fremont camped on the east side of "Rhett" (Tule) Lake from May 1 to 4, 1846. This is thought by some to be the likely location of the camp. Located 0.7 mile north of the junction of Highway 139 and Malin Road. Unmarked.

Land's Ranch Battle (C):

Registered State Historical Landmark No.108. This was the scene of a minor battle of the Modoc War, December 21, 1872. Located 0.5 mile east of the junction of Highway 139 and Malin Road. Marked.

Fort Bidwell (D):

Registered State Historical Landmark No.430. This old military post was established in 1865 to protect settlers and emigrants and stage lines from Indian attacks. Operated as military post until 1893. Marked with bronze plaque. Other points of interest in or near Fort Bidwell include:

Monroe Cabin - This pioneer cabin was built about 1864. Still standing in fair condition.

Flouring Mill - Near the mouth of Bidwell Canyon, was constructed about 1880.

Fee Ranch - Has been in continuous operation by the same family since 1867.

Kober's Store - Pioneer dry goods store.

Lowell's Store - Pioneer general merchandise store.

Conlan Ranch - Has been in operation as a cattle ranch since 1864.

Fort Bidwell Cemetery - Established about 1865; several soldiers who died while serving at the fort are buried here.

Fandango Pass (E):

Registered State Historical Landmark No.546. Pass on Applegate-Lassen Trail, 1846. Marked by stone monument and bronze plaque. The Forest Service is considering additional interpretive facilities for this area.

Chimney Rock (F):

Registered State Historical Landmark No.109. The pioneer cabin built on this site by Thomas A. Denson in 1870 was the second building in the Pit River Valley. The fireplace and flue were cut out of solid rock. Located 7.1 miles north of Alturas on Highway 395. Marked by a bronze plaque to the rock.

Bonner Grade (G):

Registered State Historical Landmark No.15. The first road from Alturas to Cedarville was constructed in 1869. Now called Cedar Pass. Unmarked.

Cressler and Bonner Trading Post (H):

Registered State Historical Landmark No.14. This was the first building erected in "Deep Creek Settlement", now Cedarville. The building was constructed in 1865 and was the first trading post north of Susanville. Located in the Cedarville park. Other points of interest in the town of Cedarville include the "new" Cressler and Bonner store, built in 1884 and the Masonic Lodge Hall, founded in 1874.

Evans-Bailey Fight (I):

Registered State Historical Landmark No.125. The scene of a minor skirmish with Indians, August 1, 1861. Evans and Bailey were killed and are buried near by. Located 5 miles southeast of Canby, $\frac{1}{4}$ mile off Centerville Road. Marked with a marble monument.

Infernal Caverns Battleground (J):

Registered State Historical Landmark No.16. The site of a battle between Indians and troops under the command of General Crook. September 26 and 27, 1867. Six soldiers killed in action are buried about one mile away. The battle site is evidently an old Indian fortification. Located about 5 miles northwest of Likely. Access is difficult. Battleground and gravesite are marked.

Emigrant Trail (K):

Registered State Historical Landmark No.111. Visible remnants of the Lassen Trail. Located about 8 miles west of Canby near the Pit River. Formerly marked, marker missing.

Battle of Scorpion Point (L):

The scene of a minor battle of the Modoc War, 1873. Located about 6 miles south of Newell. Unmarked.

Captain Warner Death Site (M):

Evidence points to this as being the site where Captain Warner was killed by Indians in 1849. Located approximately 17 miles north of Fort Bidwell on County Road No.1. Unmarked.

Highgrade Mines (N):

Site of Modoc County's only "Gold Rush" 1909-1915. Located near summit on County Road No.2 between Fort Bidwell and New Pine Creek. Some structures remain.

Leonard Hot Springs (O):

This was the first regular campsite in California for those using the Applegate Trail. 1846 to 1853. Located about 9 miles northeast of Cedarville along County Road No.18. Unmarked.

Flournoy Ranch (P):

This ranch near Likely has been in continuous operation by the same family since 1871.

Alturas (Q):

Several points of interest are found near Alturas:

A fur brigade of the Hudson's Bay Company, under the command of John Work, camped in the vicinity of the Alturas sewer plant from October 29 to November 2, 1832.

Lt. John Madigan, killed in the battle of the Infernal Caverns, buried near John Work's camp on September 28, 1867.

Dorris Bridge was a toll bridge constructed across the Pit River in 1870.

The old county building in the Veterans Memorial Park housed the county auditor's office. Now occupied by the Modoc County Chamber of Commerce.

The Nevada-California-Oregon Railroad came to Alturas in 1908 and the passenger station was constructed. In 1915 the NCO constructed an office building (now the Elk's Hall) that has an unusual architectural design. Several other old NCO buildings are still standing; the depot now houses the Garden Club and the shops were converted to a box factory now unused.

Lake City (R):

Lake City has the distinction of being the first 'subdivision' in Modoc County. The town site was surveyed by a group of promoters in 1863. Other 'firsts' claimed by Lake City include: the first white man's dwelling, the first saw mill, the first school, the first wedding. The first grist mill, built in 1869, is still standing and has operated in recent years.

Willow Ranch (S):

Andrew Snyder had a way station near here about 1868. The old barn is still standing.

Applegate Springs (Fiddler's Green) (T):

A stopping place on the Applegate Trail became headquarters for the Jesse Applegate ranch in 1871.

Emigrant Trails:

The marks left by early settlers migrating westward can still be found in Modoc County. The Applegate-Lassen Trail entered California about ten miles east of Cedarville, climbed the Warner Mountains to Fandango Pass, crossed the south end of Goose Lake and crossed the Devil's Garden to enter Oregon north of Newell. Use of this trail started about 1846 and portions are still in use today.

The Lassen Trail left the Applegate Trail near the south end of Goose Lake and followed the Pit River to the present county line near Lookout. This trail was used extensively during the gold rush of 1849 until about 1853. According to one historian, 21,000 people came to California in 1849 and 7,000 to 9,000 used this trail.

Horseback Riding:

Advocates of this activity can choose from many miles of trails and make trips lasting from a few hours to several days. This activity could benefit from the facilities listed under Backpacking and Hiking.

Hunting:

Modoc County has long been famous for mule deer hunting. Hundreds of visitors come to the county each fall to participate in this sport. The improved campsites are filled to overflowing and camps are set up along streams, near springs and on any other convenient site. The lack of developed campsites leads to sanitation and trash removal problems, but the very short season of use has discouraged the development of needed facilities.

Upland game bird hunting attracts very few out of county participants. Seasons nearly coincide with the deer season and hunters often combine deer and upland game hunting trips.

Migrating waterfowl attract many local hunters and visitors. Many of the county's ranchers have leased hunting privileges to gun clubs or guides so these lands are not open to general public use.

Organized Sports:

Included in this category are auto racing, Little League baseball, men's softball and basketball, league bowling, roping contests and other group activities. Most of the communities in the county have private or group operated facilities for one or more of these sports.

Rock Hounding:

Modoc County provides good opportunities for the rock hound. Pursuers of this activity find a wide variety of stones to collect. Much of the summer use of the developed camp areas is by these people.

Scenic Drives:

Nearly every road in Modoc County provides an interesting scenic drive. The more outstanding of these are shown on the Recreation map. Because of the vast areas of federal land, these values are recognized and maintained by the responsible agencies.

Trail Bike Riding:

There are almost unlimited opportunities for bike riding in Modoc County. Terrain varies from flat to mountainous and large areas have roads and trails that are suitable for trail bikes and 4-wheel drive vehicles. The South Warner Wilderness and several other areas are closed to motorized vehicles or have restrictions on this use. Trail bikes can cause considerable environmental damage unless riders exercise good judgment. Continued growth of this sport may eventually require the development or designation of areas where use can be restricted to land that is not susceptible to damage.

Water Sports:

Several of the larger reservoirs are used for fishing, boating and water skiing. Docking facilities are available on some of these.

Some of the reservoirs are used for swimming and there are pools in Alturas and near Cedarville. The Cedarville pool is a private operation and is used year around. Consideration should be given to providing year around facilities in Alturas and other locations.

Winter Sports:

The Cedar Pass Ski Area is an excellent small facility for downhill skiing. A modern rope tow is operated and maintained by the Modoc Ski Club. This area is in need of a small modern ski lodge to replace the existing warming hut.

Opportunities for cross country skiing are just beginning to be exploited. Varied terrain choices are available to challenge the skill and stamina of these skiers.

Many of the roads through the higher elevation timbered areas are suitable for snowmobiling. A program of trail marking and a safety program should be considered to assist those involved.

RECREATION PLAN

The following proposed projects are planned to meet the foreseeable recreational needs of the county:

Community Parks have been developed in Adin, Alturas, Cedarville and Newell. A continuing program of improvement will be carried out on these parks to more fully meet the needs of the people of the use area.

Village Greens or mini-parks are planned for the communities of Canby, Davis Creek, Day, Eagleville, Fort Bidwell, Lake City, Likely, Lookout and New Pine Creek. These areas will be less than one acre in size and may contain the following facilities: picnic tables, fireplaces, rest rooms, drinking water, play areas and parking areas. Landscaping will be minimal and dependent on the site, water supply and other factors. Individual designs will fit the needs of the local people and provide rest stops for the traveling public. Some Village Greens may become community projects, with local organizations providing most of the maintenance and some of the basic facilities.

The Cressler-Bonner Trading Post in Cedarville will be preserved and an attached building restored for use as a community building and possibly a branch museum.

The Modoc County Museum in Alturas will be provided with additional space to house the growing collection representing the entire county. This project may include the preservation of a historical building in Alturas.

The Cedar Pass Ski Area will be improved by the construction of a small lodge and additional tow facilities. This development will be carried out by the Modoc Ski Club with appropriate assistance from the county.

Campgrounds and Boat Launch Facilities have been constructed at Fee Reservoir and West Valley Reservoir. A boat launch facility was installed at Big Sage Reservoir and the Forest Service installed camp and picnic facilities there. We will add to these facilities and provide similar developments at Bayley, Torrenson and Lower Roberts Reservoirs if sufficient demand arises.

IMPLEMENTATION OF THE RECREATION PLAN

Funding

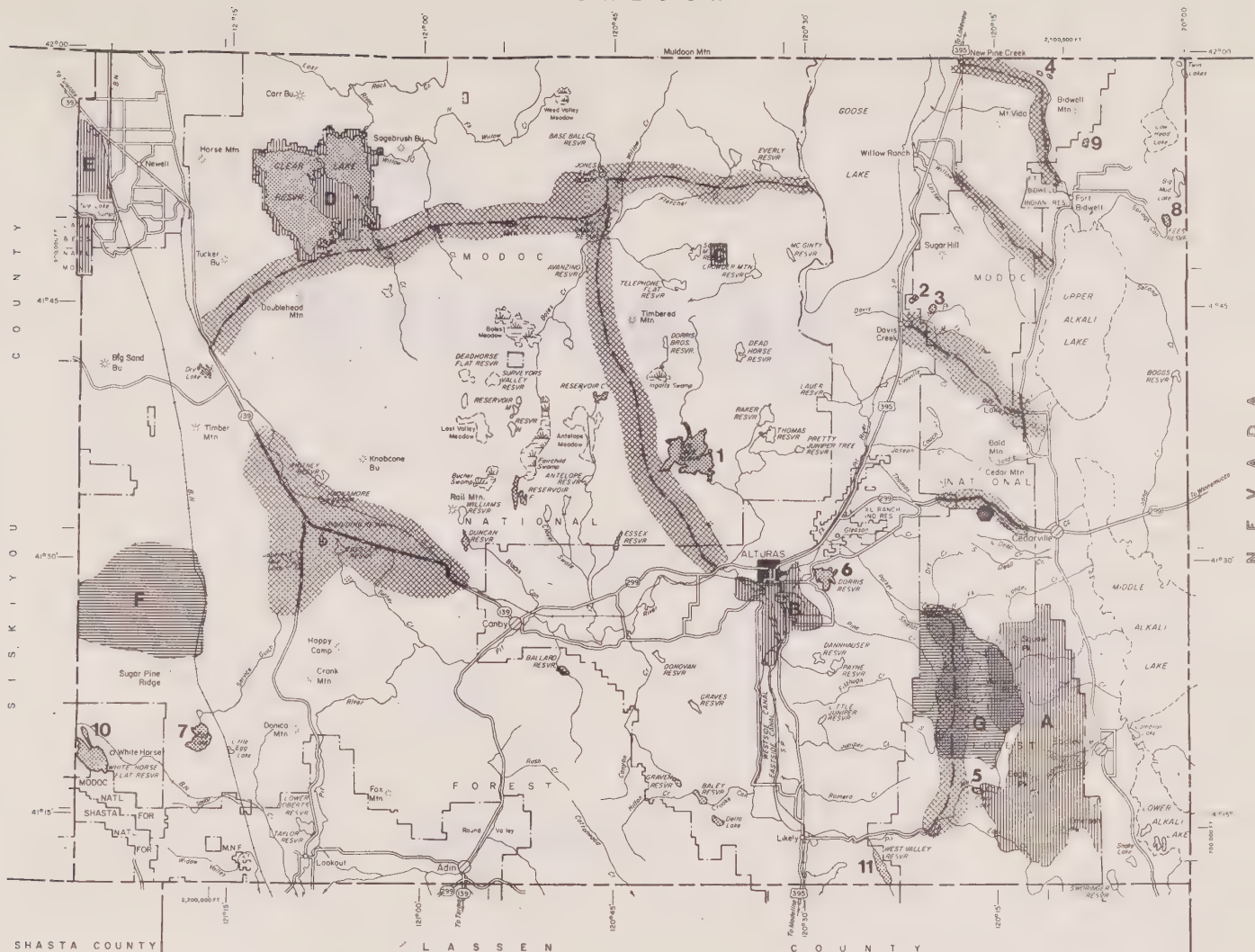
The proposed State Bond Issue of 1974 is the primary source of funds being looked to for financing the planned developments. Other sources may include: Land and Water Conservation Fund Act, county and city appropriations, contributions by local organizations and individuals.

Land Acquisition


Land for recreational development will be obtained by purchase, donation or through the Federal Public Purposes authority.


Operation and Maintenance




The county will assume the major responsibility for the operation and maintenance of county financed facilities. In some cases, however, operation and maintenance agreements will be developed with appropriate special purpose districts or organizations.



RECREATION MAP

-  Federal Game Refuges, Natural Areas, and Wilderness
 - A-South Warner Wilderness
 - B-Modoc Wildlife Refuge
 - C-Devils Garden Natural Area
 - D-Clear Lake Wildlife Refuge
 - E-Tulelake Wildlife Refuge

-  California State Game Refuge (overlays other areas in some cases)
 - F-Long Bell
 - G-Warner Mountain

-  I to II Fishing Reservoir (see table I4 for species)
-  Scenic Roads
-  Ski Area



LOCATION MAP

RECREATION MAP
MODOC COUNTY
CALIFORNIA

APRIL 1972

0 5 10 MILES
SCALE 1:253,440

The RESOURCES

Climate

Air

Water

Soil

Vegetation

Wildlife

Fisheries

Minerals

Climate

THE CLIMATE OF MODOC COUNTY HAS PLAYED AN IMPORTANT ROLE IN CREATING THE WAY OF LIFE HER RESIDENTS ENJOY. THE SOMEWHAT HARSH WINTERS LIMIT THE NUMBERS OF PEOPLE RESIDING IN THE COUNTY, BUT THE OTHER SEASONS MAKE UP FOR THE HARDSHIPS THEY MUST ENDURE.

CLIMATE

The climate of Modoc County is characterized by warm, dry summers and moderately wet, cold winters. The average annual precipitation ranges from 35 inches in the southwestern mountains to less than 8 inches in the southeastern part of the county. Most of the precipitation occurs during the winter time as snow, but occasional warm rains also occur during this period. Summer time precipitation is usually limited to occasional scattered thunderstorms.

Temperatures often exceed 100° during the summer and sometimes reach a low of 30° below zero during the winter.

The average frost-free season (32°F.) varies from approximately 130 days in Surprise Valley to approximately 70 days along the Pit River. The growing period for common crops is somewhat longer. The interval between 28°F. minimum temperatures is approximately 160 days in Surprise Valley and 120 days along the Pit River. The occurrence of late winter and early spring warming periods followed by heavy frosts is a limiting factor in diversified agriculture attempts. Table 1 shows climatic features for various stations in the county.

TABLE 1 - CLIMATIC FEATURES*

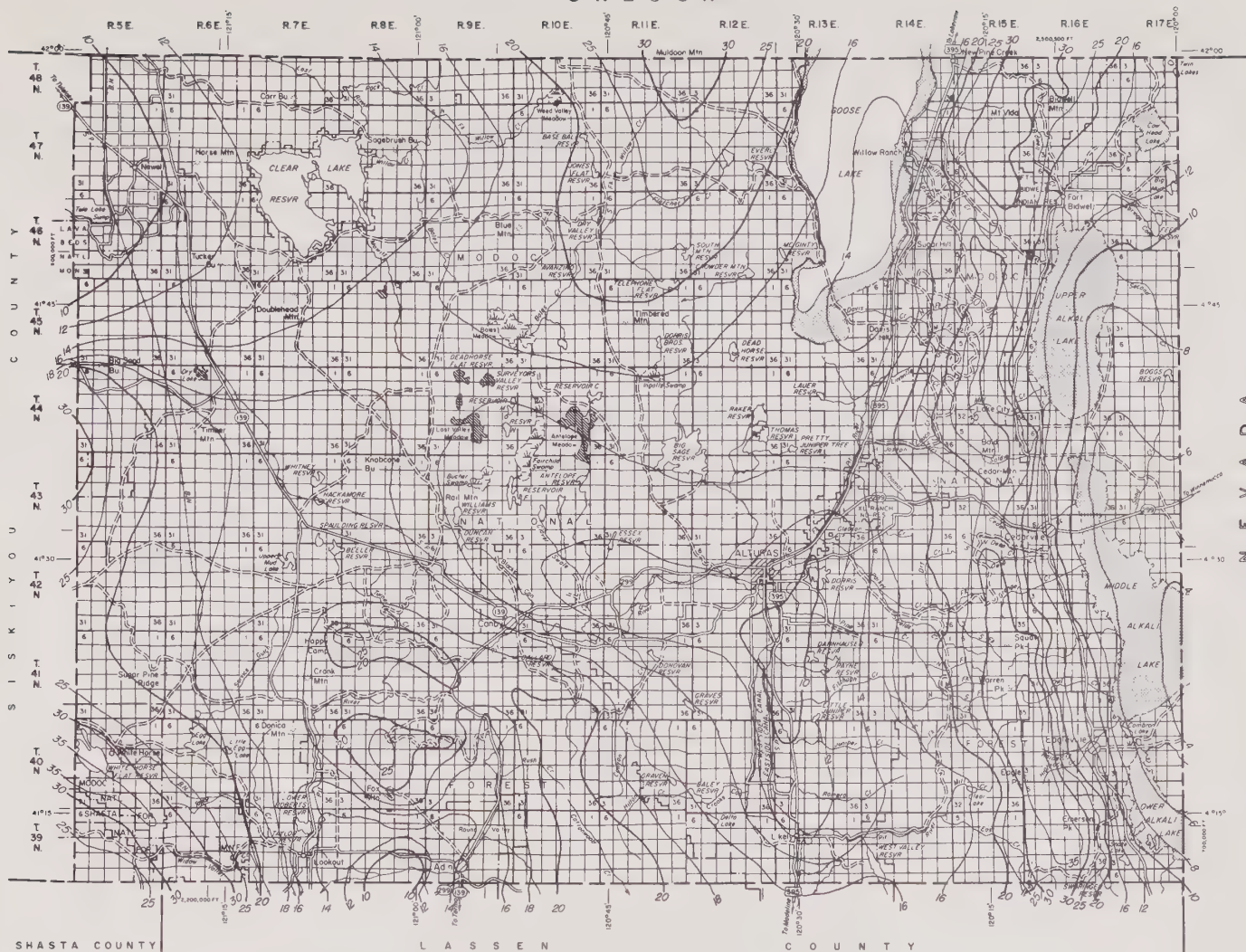
STATION	TEMPERATURE			PRECIPITATION Annual Average	SNOWFALL Annual Average	FROST-FREE SEASON*	
	Extreme High	Low	Mean Annual			28°	32°
Adin	105	-22	48.7	15.30	45.0	130	88
Alturas	107	-32	46.8	12.82	36.6	120	82
Cedarville	111	-20	49.7	12.88	44.2	166	131
Fort Bidwell	106	-25	48.3	14.71	55.6	147	123
Jess Valley	110	-33	46.0	17.22	54.5	128	88
Lake City	103	-20	48.6	21.46	78.6	155	124
Lookout	100	-25	44.9	19.80	73.3	n.a.	n.a.
Tulelake	100	-27	46.8	10.21	23.5	113	82

*From "Climate of Modoc County", U.S. Weather Bureau, 1965.

*The average number of days between the last 28° (or 32°) minimum temperature in the spring and the first 28° (32°) minimum temperature in the fall.

The "Climatic Features" map (next page) shows lines of equal mean annual rainfall (Ishohyetal), the major drainage pattern, and the live and intermittent streams in the county. This map, used in conjunction with the Hydrologic Soil Groupings, map following page 22, will indicate areas where high concentrations of runoff might be expected to occur.

OREGON



Source: Climatic Data, California Department of Natural Resources, Hydrology Section

CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 500,000 FT GRID



LEGEND

— 10 — Isohyetal



CLIMATIC FEATURES MODOC COUNTY CALIFORNIA

SEPTEMBER 1972

5 0 5 10 MILES

Air

TOPOGRAPHY, ELEVATION AND CLIMATIC
CONDITIONS COMBINE TO GIVE MODOC
COUNTY CLEAR, CLEAN AIR THAT FEW
PLACES WITHIN THE STATE CAN EQUAL.

A I R

Modoc County is fortunate in not having air quality problems to any significant degree. The climate, elevation, topography, sparse population and lack of major emission producing industries are all reasons why our air is usually clean and clear.

The lumber mills are phasing out waste burners or are in the process of converting to more efficient units that produce minimal amounts of smoke and other pollutants.

The Modoc County solid waste disposal program is being studied to develop an acceptable alternative to open burning. Progress to date is the closing of the Day dump, conversion to sanitary land fill at Alturas, plan development and land rights negotiations to convert the Newell dump to a sanitary land fill, and contracting with a consultant to develop a preliminary solid waste management study.

Agricultural burning, operation of farm, construction and industrial machinery, storage of volatile liquids and other activities with air pollution potential are regulated by the Modoc County Air Pollution Control Board. This board has adopted rules and regulations designed to comply with State Air Quality standards.

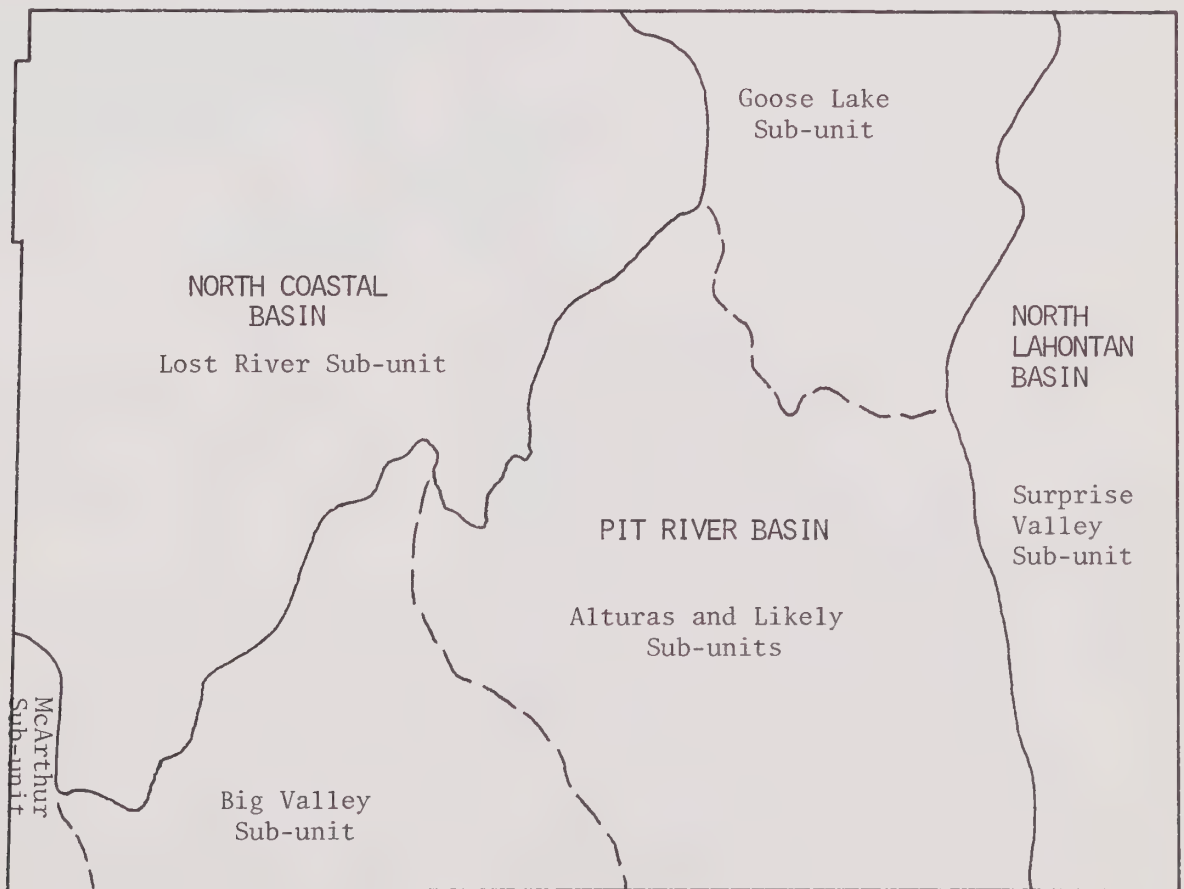
Water

WATER IS THE MOST LIMITING OF MODOC COUNTY'S RESOURCES. EACH OF THE COUNTY'S ECONOMIC ACTIVITIES IS DIRECTLY OR INDIRECTLY DEPENDENT ON THE QUANTITY AND QUALITY OF AVAILABLE WATER.

WATER

Modoc County has had a fairly reasonable distribution of water for its present level of consumption. There are, however, some problems of location, distribution, seasonal availability and pollution, as well as continued concern that what resources exist will be redistributed to satisfy needs elsewhere in California. Surface waters are mostly all appropriated for irrigation, town use, and downstream power generation. Many areas suffer from excesses of water in the spring and shortages in the late summer and fall except where upstream storage has been provided. Flooding is a common occurrence in the spring during peak runoff and abnormal periods of precipitation. Flash floods from frequent summer rainstorms have caused some localized damage to agricultural and other lands.

Modoc County's water supplies originate from both surface and underground sources. Each source is discussed briefly in this report. For more detailed information, readers are referred to Department of Water Resources Bulletin No.58 for surface water and Department of Water Resources Bulletin No.98 for underground water; and the report "Land Uses and Water Demands, Modoc County (1974).



MAJOR DRAINAGE BASINS
AND
HYDROGRAPHIC SUB-UNITS

SURFACE WATER

The major drainage basins of the county are shown on the map on page 7. The North Coastal Drainage Basin takes in the northwesternmost portion of the county. Part of the upper Pit River Drainage Basin flows into Goose Lake and part into the Pit River. The third is the North Lahontan Basin, consisting of all the Surprise Valley watersheds.

Streamflow

Melting snow provides all but a small portion of the water for the streams in Modoc County. The greatest flows usually occur during the months of March, April and May, with many streams going completely dry by the middle of June. Quantities are generally more than adequate during the spring months, but fall far short of the optimum amount during the summer. Table No.2 shows the average flows of the major streams in the county.

Occasional floods are experienced along the Pit River and on the small steep drainages on the east side of the Warner Mountains in Surprise Valley.



Flooding can occur during any month of the year as a result of convection storms, but is most frequent during the winter or early spring when snow may be melted rapidly by warm rain.



Water quality is good to excellent for most uses. Some streams carry considerable sediment during the peak runoff period. The steeper streams in Surprise Valley carry large quantities of gravel and rock when at flood stage. This condition causes clogging of irrigation systems, siltation of reservoirs and lowers the value of the stream for fisheries.

Most of the streams are used extensively for irrigation and many support excellent fisheries in their upper reaches.

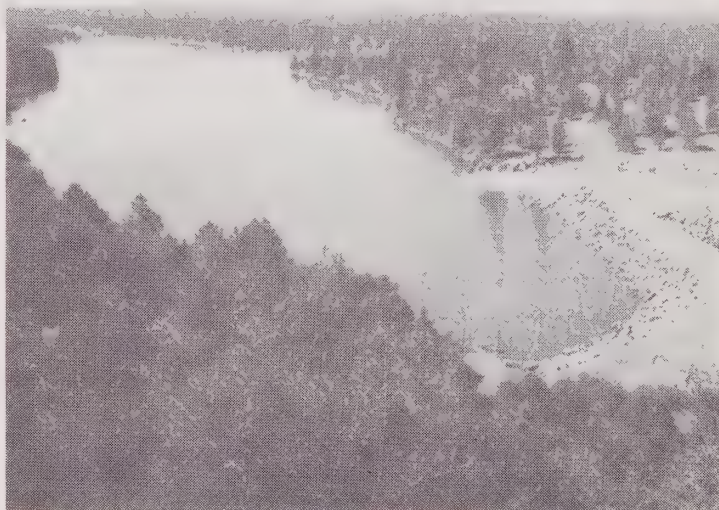
TABLE 2 - FLOW DATA FOR MAJOR STREAMS

STREAM	PLACE	AVERAGE DISCHARGE		PEAK FLOW	MINIMUM FLOW
		Acre ft.	c.f.s.	c.f.s.	c.f.s.
South Fork Pit River	Near Likely	55,500	76.6	1,620	0.2
Pit River	Near Canby	179,000	247	13,000	0.1
Pit River	Near Alturas	176,800	244	7,040	4.1
Pit River	Near Lookout	216,600	299	10,900	0.0
Ash Creek	Near Adin	54,700	75.6	2,950	0.0
Bidwell Creek	Near Fort Bidwell	16,010	22.1	682	1.4
Lost River	Below Lost Lake Res.	35,000	Controlled by USBR		
Lost River	Inflow to Reservoir	123,000	Controlled by USBR		

Data from U.S. Geological Survey "Water Resources Data for California", Part 1, Volume 2, 1971. Lost River information from Bureau of Reclamation, Klamath Falls, Oregon.

Reservoirs

Many reservoirs and ponds have been constructed in the county to store streamflow for irrigation use during short water periods. Some of these also provide excellent areas for fishing, boating and/or water fowl. Several other sites have been or are being investigated by individuals and under various assistance programs. Table No.3 shows the statistics and ownership of the major reservoirs with more than 1,000 acre feet capacity. These reservoirs are located on the map on page 10.



Lakes

The streams in Surprise Valley drain into three terminal lakes at the valley bottom. The depth and surface area of the lakes fluctuates from year to year, depending upon the amount of winter precipitation received and are completely dry after two or three consecutive years having below average precipitation. The water in the Alkali Lakes is very poor quality, having a high turbidity, salt and other mineral content due to the shallow depth and extreme wind action. The major use of the lakes is by water fowl and hunters. Residents use the lakes for ice skating during cold winters and an occasional shallow draft sailboat is seen.

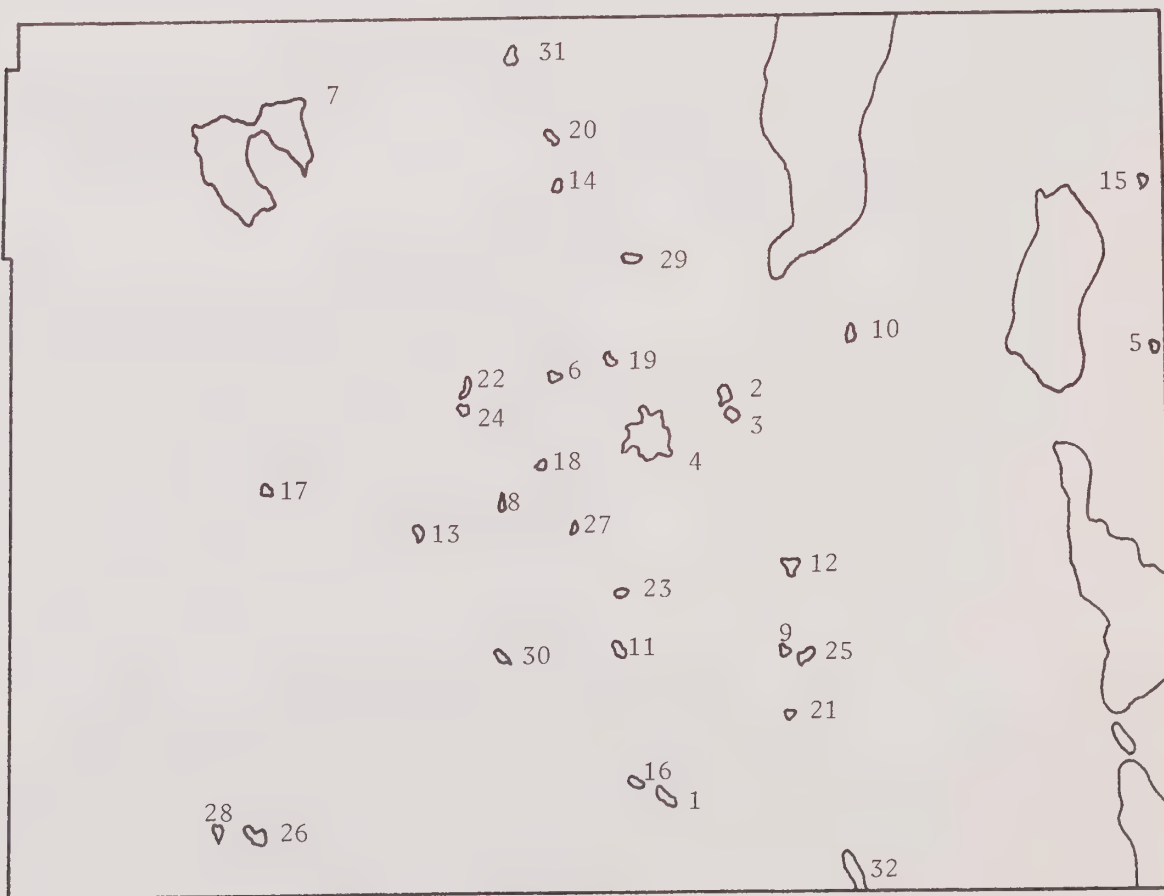
The streams in the Goose Lake sub-unit of the Pit River Drainage Basin flow into Goose Lake. At its present surface elevation Goose Lake is a terminal lake and fluctuates considerably depending upon the previous winter's precipitation. Within the

Lakes, Continued

history of white man, Goose Lake has been essentially dry several times and has also overflowed into the North Fork of the Pit River. Because of its high sodium and boron content, Goose Lake water is unusable for irrigation, the major use being for nesting and resting areas for migratory waterfowl and for stock water. A few trout and other fish species enter the lake from tributaries and inhabit waters near the mouth of the streams. Fishing and other water contact sports are not significant uses at present but there is a potential for these activities.

Clear Lake, in the North Coastal Drainage Basin, is a natural lake that has been converted into an irrigation storage reservoir for the Klamath Reclamation project. In addition to its irrigation storage use, the lake provides the nucleus for the Clear Lake National Wildlife Refuge, and provides habitat for migratory waterfowl. The lake does not support a fishery.

Several small alpine lakes occur in the Warner Mountains. The outlets on a few of these have been modified to increase their capacity for irrigation water storage. A few provide excellent trout fishing, but most lakes are shallow and freeze nearly solid during the winter months.



MAJOR RESERVOIRS

See Table 3

TABLE 3 - RESERVOIRS
IN
MODOC COUNTY
1,000 or more acre feet

<u>RESERVOIR</u>	<u>OWNER</u>	<u>ACRE FEET CAPACITY</u>	<u>STREAM</u>
1. Bayley	M.M.V. Investment	2,390	Crooks Canyon
2. Raker North	R. Schluter	6,530	Trib. Rattlesnake Cr.
3. Thomas South	R. Schluter	3,860	Trib. Rattlesnake Cr.
4. Big Sage	Hot Springs Valley Irrigation District	77,000	Rattlesnake Creek
5. Boggs	H. Westervelt	1,058	E. Fork Sand Creek
6. "C"	National Drilling Company	2,082	Trib. Clover Swale
7. Clear Lake	Bureau of Reclamation	527,000	Lost River
8. Dobe Swale	A.L. Pelissa	4,620	Trib. Witcher Creek
9. Danhauser	H.C. and J. Weber	1,258	Trib. S. Fork Pit River
10. Davis Orchard	W.T. Grace	1,200	Ewing Creek
11. Donovan	California Pines Rec. Estates	1,234	Rye Grass Swale
12. Dorris	Bureau of Sport Fish & Wildlife	11,100	Stockdill Slough
13. Duncan	F.R. Bacon, Jr.	2,575	Trib. Pit River
14. Dry Valley	Bidart Brothers	1,500	
15. Fee (Poison Spring)	Fee and Peterson	7,120	Rock Creek
16. Graven	H.E. Bell, Jr.	1,100	Trib. Canyon Creek
17. Hackamore	U.S. Forest Service	1,000	
18. Huffman Antelope	Pelissa and Hale	1,550	Clover Swale
19. Ingals Swamp	Hoxsey and Harris	2,850	Ingals Swamp
20. Janes Flat	Bidart Brothers	1,440	Mosquito Creek
21. Little Juniper	H.E. Bell, Jr.	1,370	Little Juniper Creek
22. "M"	National Drilling Company	1,000	Trib. Fairchild Meadow
23. McBrien	A. Hagge	1,000	Pit River
24. "N"	National Drilling Company	1,360	
25. Payne	C.E. Massae	2,850	Trib. South Fork Pit River
26. Roberts	Big Valley Nat'l. Water Co.	5,500	Trib. Pit River
27. SX	Pelissa and Hale	4,225	Trib. Pit River
28. Taylor	Eagle Banner Ranches	1,550	Taylor Creek
29. Telephone Flat	United States Forest Service	1,500	
30. Ballard	R.C. Monroe	1,140	Toms Creek
31. Weed Valley	Bidart Brothers	1,600	
32. West Valley	South Fork Irrigation Co.	21,700	West Valley Creek

Information from Department of Water Resources Bulletins 17-71 and 94-9.

SURFACE WATER SUPPLY VS. DEMAND

Water Supply. Data concerning the natural runoff originating in each hydrographic unit (see map, page 7) within Modoc County have been abstracted from Table IV-1 of Department of Water Resources Modoc County Report and appear in Table 4. The estimates of natural runoff contained in Table 4 represent the runoff which would occur within each specific area.

Demands. Future demands for water within each hydrographic unit were evaluated in Modoc County Report, and pertinent abstracts from Table V-2 are also shown in Table 4. Under the columns headed "Estimated Water Requirements" are listed the quantities of water needed to satisfy present requirements and projected demands to the years 1990 and 2020.

TABLE 4 - COMPARISON OF WATER SUPPLY AND DEMAND

Hydrographic Unit	AREA IN SQUARE MILES	RUNOFF IN ACRE-FEET	PRESENT	Estimated Water Requirements ac/ft.	
				1990	2020
Lost River ^{a/}	1,184	154,000	120,900	124,400	129,500
Goose Lake ^{a/}	363	50,000	20,500	26,100	32,000
McArthur	55	4,000	1,900	2,500	3,000
Alturas and Likely	1,266	150,000	139,700	159,400	183,400
Big Valley ^{b/}	706	135,000	22,800	24,100	26,000
Surprise Valley	<u>661</u>	<u>160,000</u>	<u>99,100</u>	<u>106,200</u>	<u>122,600</u>
COUNTY TOTAL	4,235	699,000	404,900	442,700	496,500

Data from Tables 24, 53 and 55, Department of Water Resources Bulletin No.58.

a/ That portion of runoff which originates in California only.

b/ Modoc County portion of Big Valley.

UNDERGROUND WATER

California Department of Water Resources Bulletin No.98 gives a comprehensive report on the underground waters of the Goose Lake Basin, the Alturas Basin, Round Valley, Big Valley and Surprise Valley. Table 5 shows the estimated quality and quantity of underground water in these basins, and the map following page 14 shows the general potential for groundwater development. Readers requiring more detailed information are referred to Bulletin No.98 but should keep in mind that it was published in 1963. Extensive groundwater development has been carried out since 1963.

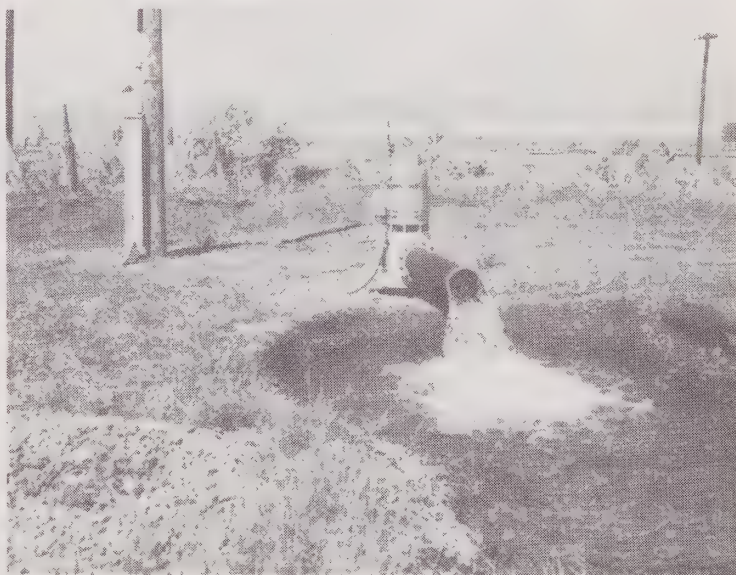
Briefly, Bulletin No.98 concludes:

Goose Lake Basin:

"Additional groundwater may be developed within Goose Lake Basin. This is particularly true for areas underlain by alluvial fans. Along the east side of the valley floor, there appears to be a groundwater quality problem area. Caution should be exercised in development of groundwater within this area".

Alturas Basin:

"Alturas groundwater basin apparently has a significant potential for additional groundwater development from aquifers within the Alturas formation. Development of these aquifers in Warm Springs Valley should be done only under the awareness of the possible water quality problem which exists within a portion of this area.



"Under the present level of agricultural development, the areas possessing the best groundwater development potential are also the areas where additional irrigation water is generally not needed. This inverse supply-requirement condition generally exists throughout most of the area of irrigable valley lands. Except within areas underlain by poor quality groundwater, lands requiring a supplemental irrigation water supply, generally can obtain this supply from groundwater, but wells constructed for this purpose generally will not be located within areas of best groundwater development potential".

Big Valley and Round Valley:

"Groundwater development for irrigation purposes by deep irrigation wells within Big Valley and Round Valley appears to be limited by the generally low permeability of aquifers within the Bieber formation. Groundwater of good quality is available except in certain localized areas where hot springs or isolated wells produce waters of poor quality".

Surprise Valley:

"Fortunately, large quantities of available groundwater underlie most of the areas requiring supplemental irrigation water. But, two possible detrimental conditions need to be considered. The first is that poor quality water will probably be encountered in part of the area. The second is that although available recharge apparently is not a limiting factor under the present level of groundwater development, there are indications that such a condition will arise with increased use unless additional recharge facilities are constructed. Insufficient data concerning the east side of the valley floor are available to form an opinion of the groundwater development potential of this area, except for the quality of groundwater underlying the area northerly from Cedar Plunge. Along the east side of the valley floor, the main water-bearing formation appears to be the Forty-nine Camp formation. A preliminary opinion concerning this formation is that it will yield moderate quantities of groundwater to wells, but recharge of this formation is insufficient for a sustained high level of groundwater development".

TABLE 5 - ESTIMATED QUANTITY AND QUALITY
OF UNDERGROUND WATER STORED IN
FIVE MODOC COUNTY STORAGE BASINS






<u>Basin</u>	<u>Estimated Storage</u>		<u>Quality</u>
	<u>Depth</u>	<u>Acre Feet</u>	
Goose Lake	0 - 500	1,000,000	Generally excellent except small area east of Goose Lake and south of New Pine Creek where wells deeper than 200 feet have encountered thermal waters with sodium bicarbonate, excess flouride and boron.
Alturas	0 - 800	7,500,000	Generally good - bicarbonates of sodium or calcium found in various locations throughout basin.
Round Valley	0 - 200	120,000	Generally excellent, some sodium bicarbonate.
Big Valley	0 - 1,000	3,750,000	Generally excellent, some nitrates, sodium bicarbonate, sodium sulfate and one well has arsenic.
Surprise Valley	0 - 400	4,000,000	Wide range of mineral quality. West of lakes generally excellent quality with some calcium or sodium bicarbonate and some local cases of flouride and boron. East of lake thermal waters are poor quality, having sodium sulfate, sodium sulfate chloride, boron and flouride; cold water in this area is generally excellent.

Data from Department of Water Resources Bulletin No.98.

OREGON



POTENTIAL FOR DEVELOPMENT OF GROUND WATER

-  Highest Potential
-  Good Potential
-  Fair Potential
-  Poor Potential
-  Not Evaluated

Date used is from Department of Water
Resources Bulletin 98

POTENTIAL FOR DEVELOPMENT OF GROUND WATER MODOC COUNTY CALIFORNIA

APRIL 1972

SCALE 1:760,000





RECHARGE AREAS AND
ARTESIAN PRESSURE



Upland Recharge Areas



Areas with Artesian Pressure

RECHARGE AREA & ARTESIAN PRESSURE
MODOC COUNTY
CALIFORNIA

Date used is from Department of Water
Resources Bulletin 98

APRIL 1972

SCALE 1:760,000

Newell Area:

The groundwater potential of the Newell area is discussed in "A Geologic and Hydrologic Reconnaissance of Lava Beds National Monument and Vicinity" published in 1968 by the United States Geological Survey.

This report states:

"A supply of groundwater can be developed at almost any site in the study area between the basin-bounding north-south faults, providing the bottom of the well is below the water table. Wells probably can be developed in those parts of the area outside the basin-bounding faults, perhaps at shallower depth, but few water-level data are available.

"Wells drilled in or adjacent to the lake deposits north of the national monument probably will yield small quantities of water that will not meet Public Health Service recommendations for chemical quality.

"The possibility of developing deep wells yielding large quantities of water of good chemical quality is present in the study area. Two public-supply wells at Tulalake are about 2,700 feet deep, and reportedly yield 1,200 gpm of water of excellent quality from the confined water body in volcanic rocks".

Recharge Areas:

Generally, the major groundwater recharge areas are on the rocky and gravelly alluvial fans that have been built up by sedimentation from the mountain ranges. Recharge is accomplished by overland flow resulting from low elevation snow melt and precipitation and by streamflow. Flood flows do not add significantly to the groundwater and frozen ground sometimes prevents recharge from precipitation. The general location of groundwater recharge areas and areas of artesian pressure are shown on the map on the preceding page. Other possible recharge areas have not been evaluated.

Thermal Water:

Thermal areas associated with the volcanics of the county are common and their waters contain hazardous levels of minerals. Hot springs are located primarily in four areas within the county, see the map following page 17, but most all of the county has hot water potential. Presently active geothermal exploration may lead to the development of this resource of or the generation of electrical power.

DISCUSSION

County-Wide Issues:

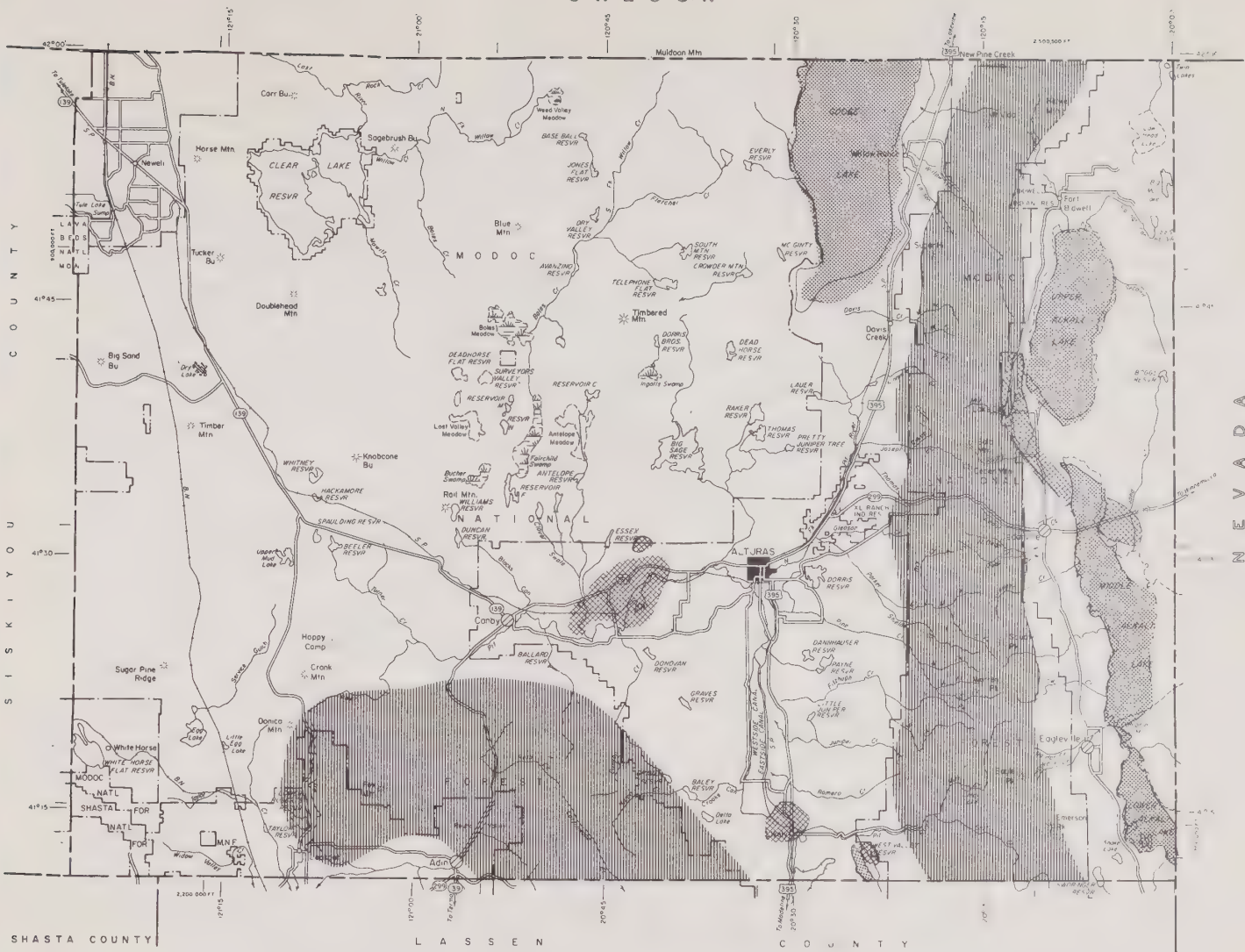
1. There is a limit to the available water supply, and there is also a limit to the consumptive uses which can be allowed. The principal industry within the county is agriculture, which also has the greatest need for water.
2. The limits of water consumption are further decreased when examining the quality of water necessary to maintain present uses. Although natural conditions have accounted for the majority of the surface water quality conditions, there are instances where man-induced conditions are of great importance.

Recommendations:

1. A priority of the various consumptive uses should be established in county policy to insure availability of adequate water supplies to meet Public Health and Safety needs as well as for resource protection.

Suggested priorities are:

1. Domestic use for presently established users (i.e. potable water)
 2. Fire protection
 3. Agricultural and natural resource protection
 4. Industrial and commercial uses
 5. Water oriented recreation
 6. Public utility consumption
2. Identified and identifiable groundwater recharge areas must be protected from surface structures and disruptions which would inhibit percolation. Such areas should be termed "Water Recharge Preserves" and should be mapped as additional research is completed to identify these areas county-wide.
3. Water well ordinances should be adopted to protect the quantity and quality of groundwater in the county.



SHASTA COUNTY

LASSEN COUNTY




MODOC COUNTY

NEVADA



LOCATION MAP

GEOLOGIC PHENOMENA

-  Lakes with water quality problems
-  Generally unstable slopes
-  Geothermal water at or near the surface

This map is for general planning rather than a basis for decisions on the use of specific tracts.

GEOLOGIC PHENOMENA MODOC COUNTY CALIFORNIA

APRIL 1972

5 0 5 10 MILES
SCALE 1:760,000



Soil

SOILS ARE THE PRODUCT OF CLIMATE AND PARENT MATERIAL. MODOC COUNTY HAS A WIDE VARIETY OF SOILS AS A RESULT OF THE VARIATION OF SOIL FORMING CONDITIONS.

SOILS

Soil differences within the county are part of the determining factors of present land use in that crop lands, range lands, forest and other types of uses are dependent on soil, climate and topography.

It should be noted that soils are a complex structure of sand, silt and clay in varying amounts and react differently in a given set of circumstances. The following is a set of features and evaluation of the soils in Modoc County. Each of the "soil interpretations" may have little meaning as a separate entity, but with all of the interpretations simultaneously examined, the evaluation of soil potentials for various uses becomes apparent. Each interpretive map will be accompanied by a write-up explaining the assumptions and criteria used in making the interpretation presented.

The interpretive maps and data were provided by the United States Soil Conservation Service in cooperation with the following Resource Conservation Districts: Adin-Lookout, Central Modoc, Lava Beds, Goose Lake and Surprise Valley.

PRECAUTIONS IN USE

Persons using this information should be aware that:

- A. Soil investigations, mapping and interpretations ordinarily apply to the upper 5 or 6 feet of soil material.
- B. There should be onsite investigations of any proposed use before a final decision is made. Onsite investigations are especially necessary to verify engineering properties at structure sites or in important construction areas.
- C. Soil properties do not function independently of each other. The influence of any one soil property depends upon the other soil properties present.
- D. Criteria for interpretations are based upon present knowledge and may change somewhat in the future with more experience and data.
- E. The following maps have been developed from the General Soils Report on Modoc County and are for use in general planning only. Although the most likely limiting major soil feature or problem to be found in an area has been indicated, it is not always the only one. Therefore, these maps cannot take the place of detailed soils maps or onsite investigation.
- F. A severe limitation does not necessarily mean that the desired use is impossible. Special engineering and/or construction techniques may make it practical to carry out the desired use.

HYDROLOGIC SOIL GROUPS

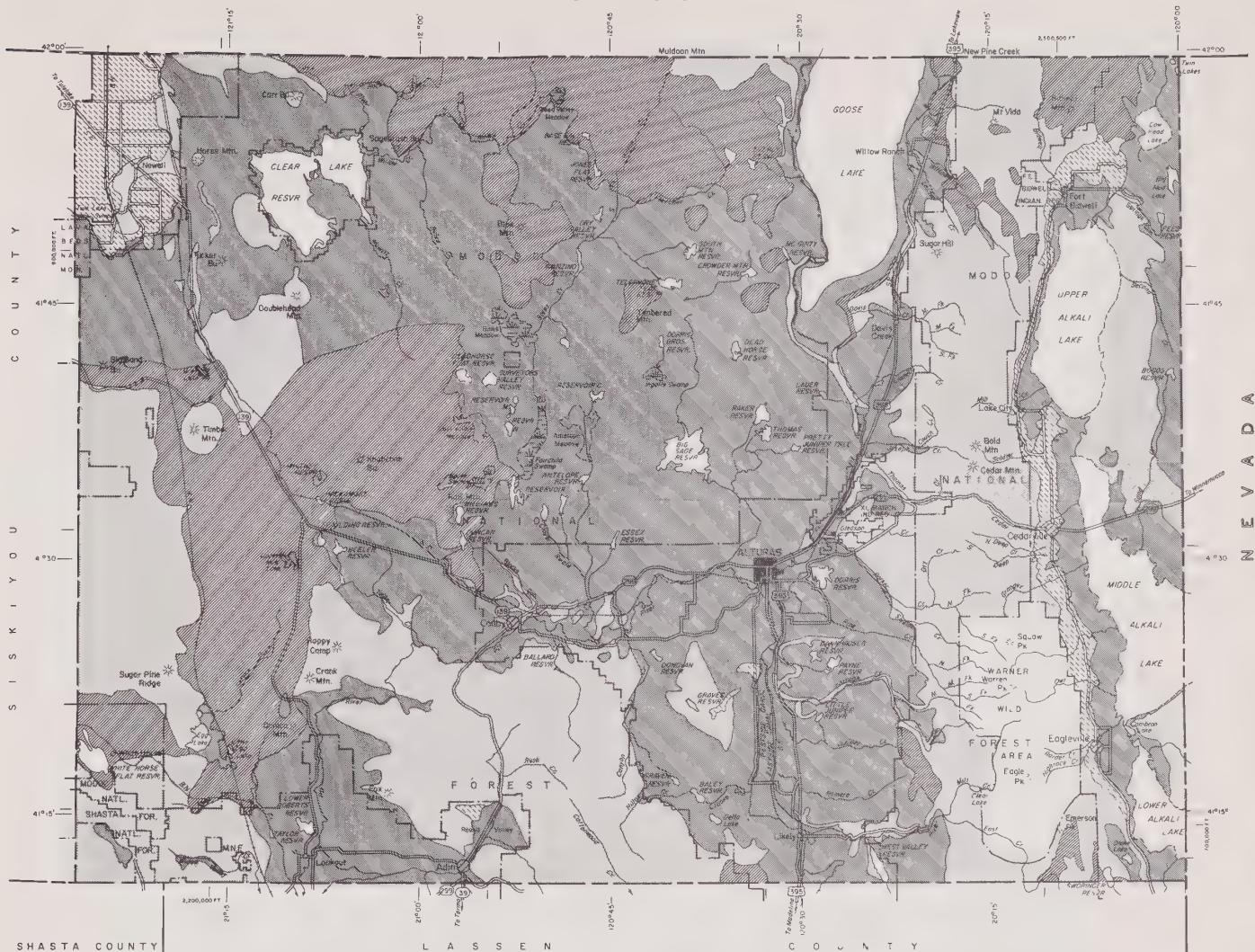
Hydrologic groupings, as described in this report, place together soils that have similar rates of runoff, under bare surface conditions and after prolonged wetting. The infiltration rate of a soil has a major influence on the runoff it will yield after a given intensity storm. Predictions of runoff must take into consideration several other factors, including cover characteristics, slope and whether or not the ground is frozen.

Groups

- A. Low runoff potential. Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. These soils have a high rate of water transmission.
- B. Moderately low potential. Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.
- C. Moderately high potential. Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures. These soils have a slow rate of water transmission.
- D. High runoff potential. Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.





Bottomland soils are mostly in the C or D hydrologic group because of heavier textures. Foothill soils include all groups, with C predominating. Mountain soils fall mostly in the C group with significant areas of B and D.

OREGON



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT GRID

HYDROLOGIC CLASSIFICATION OF SOIL RUNOFF POTENTIAL

- A  Low
- B  Moderately Low
- C  Moderately High
- D  High

Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association; otherwise the most extensive limitation is shown.

*Criteria used is from California Soils Memorandum 32 (Rev. 1) Soil Survey Interpretations dated June 1970.

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



LOCATION MAP



HYDROLOGIC CLASSIFICATION OF SOIL MODOC COUNTY CALIFORNIA

ADIR-LOOKOUT, CENTRA, MODOC, GOOSE LAKE, LAVA BEDS,
AND SUPER VALLEY RESOURCE CONSERVATION DISTRICTS
PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE,
SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLAN-
NING COMMISSION, MODOC COUNTY, CALIFORNIA

MARCH 1973

5 0 5 10 MILES

SOIL INTERPRETATION FOR VEGETATIVE SOIL GROUPS

A vegetative soil group is a grouping of soils which have similar properties and qualities that characterize the group from a plant adaptation and use standpoint. To determine the best adapted plants for conservation practices and forage production the limiting major soil feature or problem must be defined with the assumptions that climatic factors as precipitation, maximum-minimum temperatures, length of growing season, and elevation, and modifications such as irrigation, are considered and handled separately.

Criteria

The major soil features which determine plant adaptation and permissible range within each vegetative soil group are shown in the following table. The heavily outlined boxes indicate the key factor for each group.

There are six limiting major soil features recognized in Modoc County. The coarse texture group is found in recent alluvium on the east side of the Warners and the Willow Ranch - New Pine Creek area, and where pumice occurs on the west side of the county. The claypan group where found is in old soils in the valleys. Wetness is found along the rivers with salinity and alkalinity being found in the valleys just above the wet areas. The shallowness group is found in the highest parts of the valleys where hardpan and/or hard parent material occurs. Although much shallowness is found in the uplands, more severe limitations such as rockiness has placed most of the uplands into the nonarable, miscellaneous group.

Group Description

Coarse texture - Choice of plants limited by drouthiness and low fertility level. Soils are coarse through gravelly medium textured, excessively drained, with less than 5 inches of available waterholding capacity in the root zone.

Claypan - Choice of plants limited by very slowly permeable (claypan) subsoils. Soils are moderately well drained, with slow or very slow subsoil permeability.

Wetness - Choice of plants limited by wetness. Soils are somewhat poorly through very poorly drained. (Drained soil phases will be placed in appropriate group according to their current drainage status. Slight salinity and/or alkalinity may be present.)

Salinity or alkalinity - Choice of plants limited by salinity or alkalinity. Soils are moderately through strongly saline-alkali, and usually somewhat poorly or poorly drained.

Shallowness - Choice of plants limited by depth. Soils are shallow through moderately deep, well drained, over hardpan, bedrock, or other unfractured dense material.

Miscellaneous - Choice of plants depends upon onsite investigation. Soils include those in the miscellaneous nonarable category, such as riverwash, stony or rocky upland, etc.

TABLE 6 - CRITERIA FOR VEGETATIVE SOIL GROUPS

Veg. Group Symbol	Major Soil Limitation	Effective Depth (in.)	Surface Texture 9/	Subsoil Permeability 1/	Drainage Class 2/	Salinity & Alkalinity 3/	Reaction 4/	Erosion	AWC (in.) 5/
Coarse Texture	drouthi-ness	36 or more	s, ls, gsl, vg, k	very rapid through very slow	excessively through moderately well	none through slight	strongly acid through mod. alkaline (pH 5.1-8.4)	slight through mod.	5 or less
Claypan	claypan soils 6/	10 through 36	sl through sicl	slow or very slow	well through somewhat poorly	none through slight	med. acid through mod. alkaline (pH 5.6-8.4)	slight through mod.	3 or more
Wetness	wetness	20 or more	s through c	rapid through slow	somewhat poorly thr. very poorly	none through slight	med. acid through mod. alkaline (pH 5.6-8.4)	slight through mod.	3 or more
Salinity or Alkalinity	salinity or alkalinity	20 or more	s through c	rapid through slow	mod. well through poorly	moderate through strong	neutral through very strongly alk. (pH 6.6-9.0±)	slight through mod.	3 or more
Shallow-Depth	shallow depth 7/	10 through 36	s, ls, vg, k, sl thr. sicl	moderately rapid through very slow	moderately well thr. somewhat excessively	none through slight	medium acid through moderately alkaline (pH 5.6-8.4)	slight through mod.	3 or more
		10 through 20	c, sic, gc						
Misc.	severe 8/	any	any	very rapid through very slow	excessively through very poorly	none through strong	any	slight through severe	any

NOTE: The heavily outlined boxes indicate the key factor(s) for each group.

OREGON



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT GRID



Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

VEGETATIVE SOIL GROUPS

- Coarse Texture
- Claypan
- Wetness
- Salinity or Alkalinity
- Shallowness
- Miscellaneous

Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association, otherwise the most extensive limitation is shown.

"Criteria used is from California Soils Memorandum 32 (Rev. 1) Soil Survey Interpretations dated June 1970."

USDA-WES-PORTLAND, OREG. 1973

VEGETATIVE SOIL GROUPS MODOC COUNTY CALIFORNIA

ADIN-LOOKOUT, CENTRA, MODOC, GOOSE LAKE, JAVA BEDS
AND SPRING VALLEY RESOURCE CONSERVATION DISTRICTS
PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLANNING
COMMISSION, MODOC COUNTY, CALIFORNIA

MARCH 1973

5 0 5 10 MILES

FOOTNOTES

All terms are standard. For definitions see SCS TN-Soils-9 (rev) March 1967, or Agr. Handbook No.18, USDA-SCS. Criteria in box(es) are main soil feature determining vegetative group.

- 1/ Subsoil permeability refers to permeability of the B horizon(s) or the 10- to 40-inch control section in soils without B horizons.
- 2/ Drainage class refers to drainage of soils that do not have altered drainage. If the soils have been drained, use class that most nearly reflects growing conditions following drainage improvement.
- 3/ Use current levels of salinity and alkalinity that are present in the field. Levels may be higher or lower than indicated on maps. Capability unit designations may be based on general assumptions that do not uniformly reflect current, short-term growing conditions on each parcel of land.
- 4/ Generally applies to the soil to a depth of 20 inches.
- 5/ Limits are for total available water-holding capacity for that part of the soil profile generally available to roots or to a depth of 60 inches if no severe intervening restrictions of soil or water are present. Refer to California Soil Handbook Chapter 3, Section 3.423.
- 6/ Soils in this group must have a clay increase of at least 15 percent, absolute, within 1 inch, or an abrupt or very abrupt AB boundary.
- 7/ Depth to unfractured rock or hardpan. If a claypan over 6 inches thick is present over rock or hardpan, place in Group D. See note 6 for other claypan criteria.
- 8/ Includes all soils not suitable for routine cultivation, seedings, and planting. Includes all class VII and VIII land, very cobbly soils, soils in class 3, 4 and 5 rockiness, class 2, 3, 4 and 5 stoniness. These soils require onsite recommendation.
- 9/ Textures - s = sand, ls = loamy sand, gsl = gravelly sandy loam, sl = sandy loam, l = loam, sil = silt loam, si = silt, sicl = silty clay loam, sic = silty clay, cl = clay loam, c = clay, gc = gravelly clay, vg = very gravelly, k = cobbly.

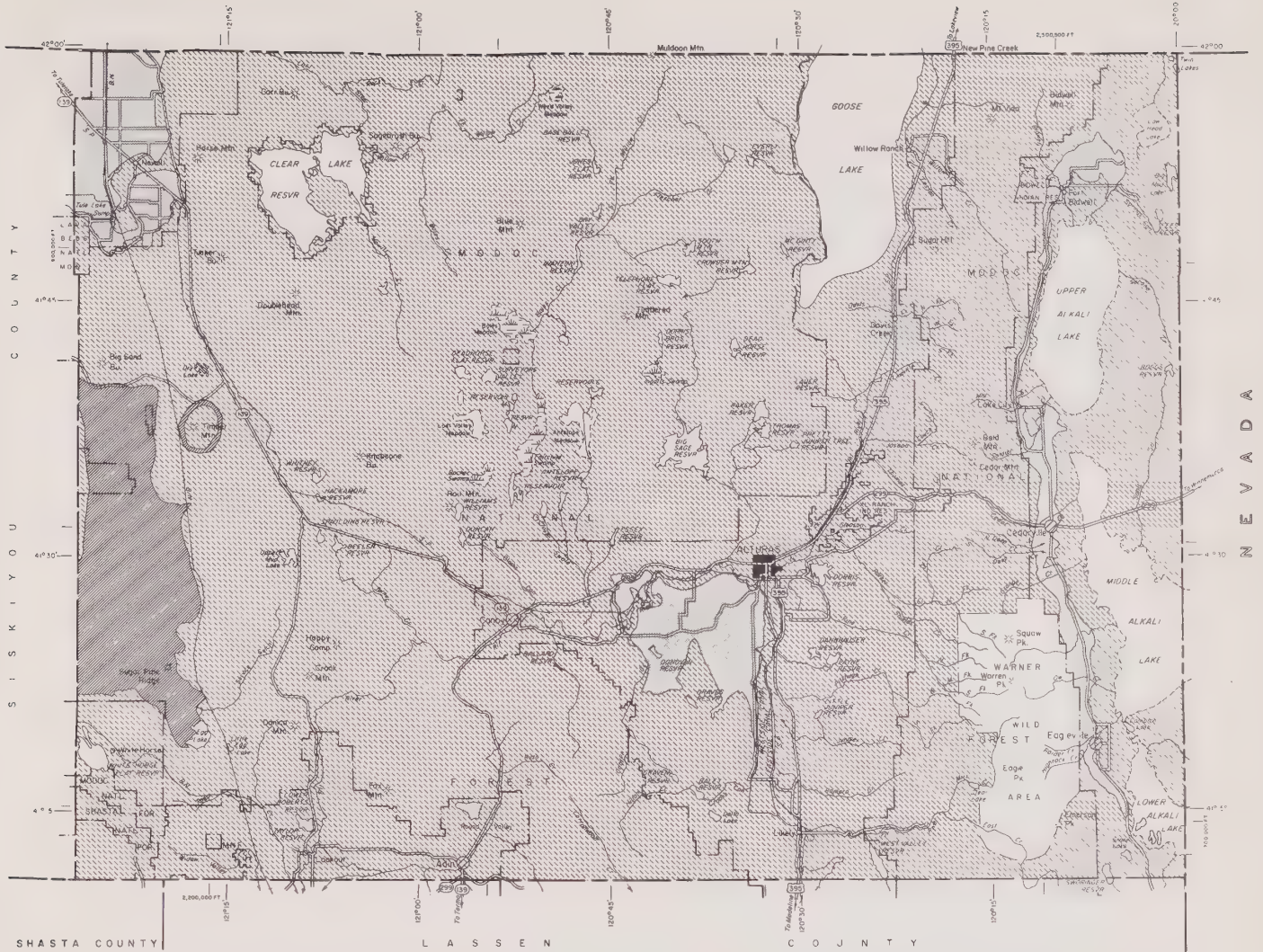
LIMITATIONS: DWELLINGS WITHOUT BASEMENTS

The emphasis in rating soils for dwellings is on the properties that affect foundations, but also considered beyond the effects related exclusively to foundations are slope, susceptibility to flooding, seasonal wetness, and other hydrologic conditions. The properties influencing foundation support are those affecting bearing capacity and settlement under load and those affecting cost of excavation and construction. Properties affecting bearing strength and settlement of the natural soil are density, wetness, flooding, plasticity, texture, and shrink-swell potential. Properties influencing the amount and ease of excavation are wetness, slope, depth to bedrock, stoniness and rockiness. Also considered are soil properties, particularly depth to bedrock, that influence installation of utility lines, such as the lines between dwellings and trunk-lines. It is important to note that onsite investigations are needed for interpretations relevant to detailed design of foundations or to specific placement of buildings and utility lines.

It also is important to note that interpretations for soil-induced corrosivity of steel and concrete are not included in these ratings.

TABLE 7 - SOIL LIMITATION RATINGS FOR DWELLINGS

Item affecting use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Soil drainage class	Excessively drained, somewhat excessively drained, well drained, moderately well drained	Somewhat poorly drained	Poorly drained, very poorly drained
Seasonal water table (Seasonal means for 1 month or more)	Below a depth of 30 inches	Below a depth of 20 inches	Above a depth of 20 inches
Flooding	None	None	Rare, occasional or frequent
Slope	0-8 pct	8-15 pct	More than 15 pct
Shrink-swell potential	Low	Moderate	High
Unified soil group	GW, GP, SW, SP, GM, GC, SM, SC, CL, with PI (plasticity index) less than 15	ML, CL with PI 15 or more	CH, MH, OL, OH
Potential frost action	Low	Moderate	High
Stoniness class	0 and 1	2	3, 4 and 5
Depth to bedrock	More than 40 in.	20-40 in.	Less than 20 in.



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT GRID



DWELLING LIMITATIONS

- Slight Limitations
- Moderate Limitations
- Severe Limitations

Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association, otherwise the most extensive limitation is shown.

"Criteria used is from Soils Memorandum 45 (Rev. 2)
Soil Interpretations for Engineering, January 1972."

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



LOCATION MAP

DWELLING LIMITATIONS MODOC COUNTY CALIFORNIA

ADIN-LOOKOUT, CENTRAL MODOC, GOOSE LAKE, JAVA BIDS
AND SURRIVE VALLEY RESOURCE CONSERVATION DISTRICTS
PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE,
SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLAN-
NING COMMISSION, MODOC COUNTY, CALIFORNIA

MARCH 1973

5 0 5 10 MILES

SOIL LIMITATION RATING FOR SEPTIC TANK

ABSORPTION FIELDS IN MODOC COUNTY

The data contained in this inventory is intended to be broad in scope and may vary considerably even in one soil complex. For more detailed information on the subject you may review the references listed in the inventory.

The ability of the soil to accept effluent is controlled by a number of soil properties. Eight properties are identified in the criteria on the following page; a degree of limitation can be assigned to a soil based on these properties.

Slight, moderate, and severe are the limitations assigned to soils to reflect limitations on its use for septic tank absorption fields.

Following the criteria is a map showing the ratings given to soils in Modoc County.

References

- (1) International Conference of Building. 1967 Uniform Building Code.
- (2) United States Department of Health, Education and Welfare. 1967 Manual of Septic tank practice. Pub. No.526 U.S. Public Health Service. 92 pp.
- (3) Western Plumbing Officials Association. 1964 Uniform Plumbing Code.

TABLE 8 - SOIL LIMITATION RATINGS FOR SEPTIC TANK ABSORPTION FIELDS

Item affecting use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Permeability	Rapid <u>2/</u> moderately rapid, and upper end of moderate	Lower end of moderate	Moderately slow <u>3/</u> and slow
Hydraulic conductivity rate (Uhland core method)	More than 1 in./hr. <u>2/</u>	1-0.6 in./hr.	Less than 0.6 in./hr.
Percolation rate	Faster than 45 min./in. <u>2/</u>	45-60 min./in.	Slower than 60 min./in.
Depth to water table	More than 72 in.	48-72 in.	Less than 48 in.
Flooding	None	Rare	Occasional or frequent
Slope	0-8 pct	8-15 pct	More than 15 pct
Depth to hard rock, <u>4/</u> bedrock or other impervious materials	More than 72 in.	48-72 in.	Less than 48 in.
Stoniness class <u>5/</u>	0 and 1	2	3, 4 and 5
Rockiness class <u>5/</u>	0	1	2, 3, 4 and 5

1/ Class limits are the same as those suggested by the Work-Planning Conference of the National Cooperative Soil Survey. The limitation ratings should be related to the permeability of soil layers at and below depth of the tile line.

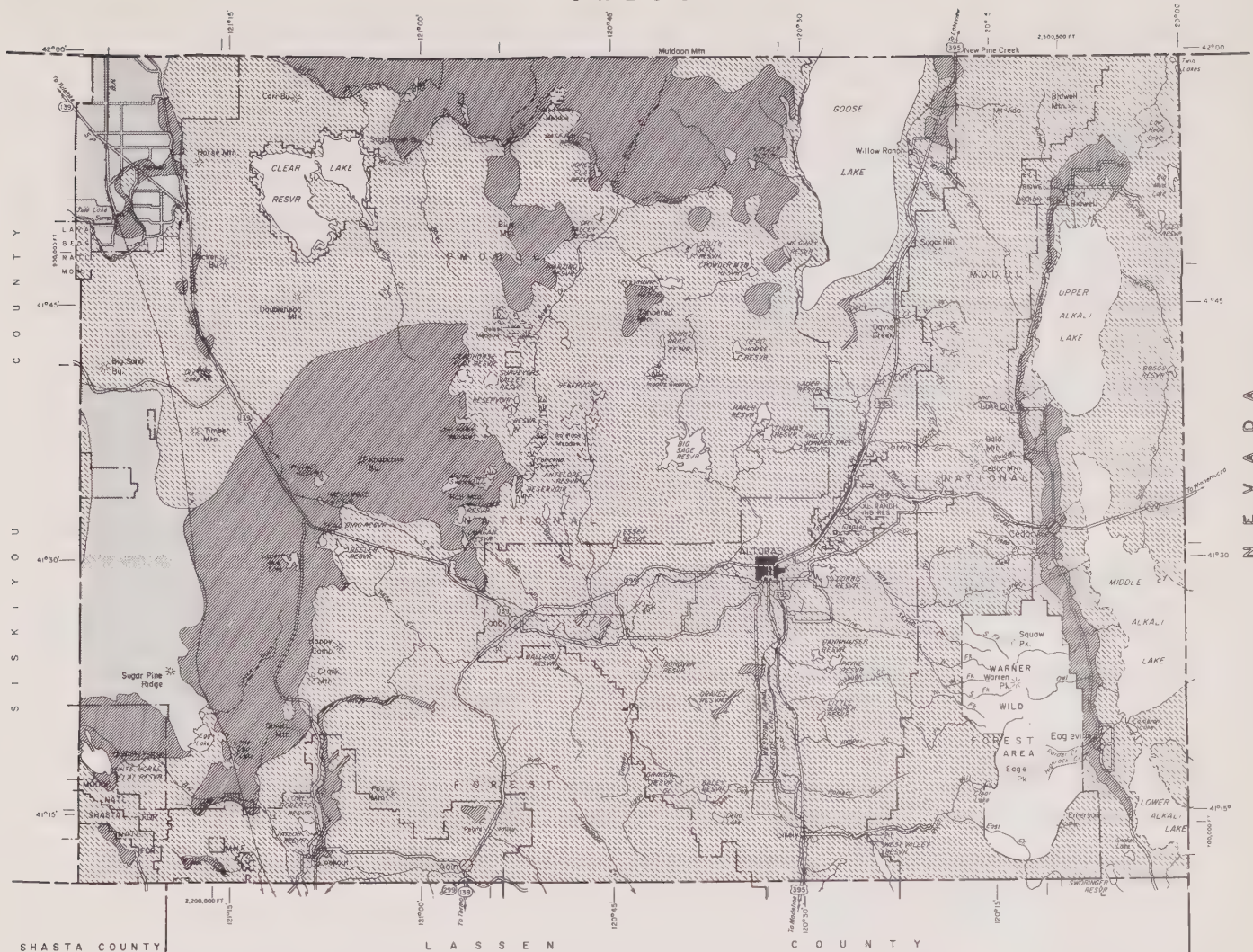
2/ Indicate by footnote where pollution is a hazard to water supplies.

3/ In arid or semiarid areas, soils with moderately slow permeability may have a limitation rating of moderate.

4/ Based on the assumption that tile is at a depth of 2 feet.

5/ For class definitions see Soil Survey Manual, pp. 216-223.

OREGON



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT GRID

SOIL LIMITATION FOR SEPTIC TANK

ABSORPTION FIELDS



Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association; otherwise the most extensive limitation is shown.

"Criteria used is from Soils Memorandum 45 (Rev. 2)
Soil Interpretations for Engineering, January 1972."

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SOIL LIMITATION FOR SEPTIC TANK ABSORPTION FIELDS MODOC COUNTY CALIFORNIA

ADIN-LOOKOUT, CENTRAL MODOC, GOOSE LAKE, LAVA BEDS,
AND SUPPLY VALLEY RESOURCE CONSERVATION DISTRICTS
PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE,
SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLANNING
COMMISSION, MODOC COUNTY, CALIFORNIA

MARCH 1973

5 0 5 10 MILES

LIMITATIONS FOR SHALLOW EXCAVATIONS

These interpretations are for applications that require excavating or trenching to a depth of 5 or 6 feet. Limitation ratings for shallow excavations alone, though highly relevant, are insufficient for interpretations for ultimate uses, such as for dwellings with basements, sanitary landfills, cemeteries, and underground utility lines, sewers, pipelines and cables. Additional soil features must be considered in evaluating soils for those uses. For example, additional interpretations concerning shrink-swell potential and corrosivity are needed for giving ratings for the ultimate use of soils for pipelines.

In soils used for shallow excavations, desirable characteristics are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops and big stones, and no flooding hazard or water table problems.

Modoc County soils have either moderate or severe limitations for shallow excavations.

Bottomland soils generally are affected by wetness and heavy textures. Foothill soils are gravelly, stony, shallow or have clay subsoils. Mountainous areas are generally limited by slope, depth and/or stones.

TABLE 9 - CRITERIA FOR DETERMINING
LIMITATIONS FOR SHALLOW EXCAVATIONS

Item affecting use	Degree of Soil Limitation		
	Slight	Moderate	Severe
Soil drainage class	Excessively drained, somewhat excessively drained, and well drained	Moderately well drained	Somewhat poorly drained, poorly drained and very poorly drained
Seasonal water table	Below a depth of 60 inches	Between depths of 30 and 60 inches	Above a depth of 30 inches
Flooding	None	Rare	Occasionally or frequent
Slope	0-8 pct	8-15 pct	More than 15 pct
Texture of soil to depth to be excavated <u>1/</u> , <u>2/</u>	Fine sandy loam, sandy loam, loam, silt loam, silty clay loam, sandy clay loam	Silt, clay loam, sandy clay and all gravelly types	Clay, silty clay, sand, loamy sand, organic soils, all very gravelly types
Depth to bedrock <u>3/</u>	More than 60 inches	40-60 inches	Less than 40 inches
Stoniness class <u>4/</u>	0 and 1	2	3, 4, and 5
Rockiness class	0	1	2, 3, 4 and 5

1/ Texture is used here as an index to workability and sidewall stability.

2/ If soil contains a thick fragipan, duripan, or other material difficult (but not impossible) to excavate with handtools, increase the limitation rating by one step unless it is severe.

3/ If bedrock is soft enough so that it can be dug out with ordinary handtools or light equipment, such as backhoes, reduce ratings of moderate and severe by one step.

4/ For class definitions see Soil Survey Manual, pp. 216-223.

OREGON



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT. GRID

SOIL LIMITATIONS FOR SHALLOW EXCAVATION



Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association, otherwise the most extensive limitation is shown.

"Criteria used is from Soils Memorandum 45 (Rev. 2) Soil Interpretations for Engineering, January 1972."

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



LOCATION MAP

SOIL LIMITATIONS FOR SHALLOW EXCAVATION MODOC COUNTY CALIFORNIA

ADIN-ADOKOUT, CENTRAL MODOC, E LAKE, LAVA BEDS, AND UPPER LAKE, ATOKOUT, RESERVATION DISTRICTS, PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, THE MODOC COUNTY PLANNING COMMISSION, MODOC COUNTY, CALIFORNIA.

APRIL 1972

5 0 5 10 MILES

SOIL LIMITATION RATING FOR SHRINK-SWELL BEHAVIOR

The characteristic of soil to change its volume with a change in moisture content is known as shrink-swell behavior. It determines, to a large degree, how a soil is used. Its rating may point out the need for a more detailed investigation before certain changes in land use are made.

Criteria for establishing ratings are included on the following page. Five degrees of limitation: very low, low, moderate, high and very high established.

Classification for shrink-swell behavior is based on the B horizon or control section of soil, unless otherwise noted.

TABLE 10 - CRITERIA FOR DETERMINATION
LIMITATIONS FOR SHRINK-SWELL BEHAVIOR

Soil Property or Quality	DEGREE OF LIMITATION				
	Very Low	Low	Moderate	High	Very High
Usual Usual Texture - kind of clay miner- ology	Loamy Sand, Mixed Sand or Sandy loam, Loam, - Kaolinite Silt loam	Silt loam, Silty clay loam, - Kaolinite clay loam, silty clay, sandy clay, clay	Silty clay, Silty Mixed and clay some Mont- loam, - morillinite Clay loam, Sandy clay loam, Clay	Clay loam, Silty Mont- clay morill- loam, -inite Silty and clay, some Sandy mixed clay, Clay	Clay, Silty clay, Mont- sandy morill- clay -inite
Coefficient of Linear Extensi- bility (COLE) (in/in)	0.01 or less	0.01-0.03	0.03-0.06	0.06-0.09	0.09 and more
Potential volume change (PVC)	1.0 or less	1-2	2-4	4-6	6 and more

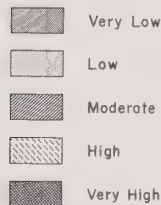
OREGON



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT GRID.



LEGEND



Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over 10% of the soil association; otherwise the most extensive limitation is shown.

*Criteria used is from Soils Memorandum 45 (Rev. 2) Soil Interpretations for Engineering, January 1977.

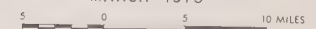
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SHRINK SWELL POTENTIAL MODOC COUNTY CALIFORNIA

ADIR-LOOKOUT, CENTRAL MODOC, GOOSE LAKE, LAVA BEDS, AND WARREN VALLEY RESOURCE CONSERVATION DISTRICTS, PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLANNING COMMISSION, MODOC COUNTY, CALIFORNIA

MARCH 1973



SUITABILITY
FOR ROAD CONSTRUCTION

Suitability of soils for roads is quite limited due to certain restrictions of the soil. Consideration must be given use of soils for construction and maintenance of local roads and streets. The roads and streets consist of (1) underlying local soil material, whether cut or fill, that is called "the subgrade"; (2) the base material of gravel, crushed rock, or some form of stabilized soil; and (3) the actual road surface or pavement. These roads are generally graded to shed water, and drainage measures are provided.

For general guidance in determining limitation ratings for use of soils for local roads and streets check the guide sheet on the next page - Soil Limitations for Local Roads and Streets.

For general guidance in determining road fill use the guide sheet on the following page - Suitability Ratings of Soils as Sources of Road Fill.

Since soil survey interpretations are oriented to local roads and streets rather than to highways, the assumption is that the degree of limitations are evaluations of the soils as sources of road fill for low embankments, generally less than 6 feet high and less exacting in design than high embankments.

TABLE 11 - SOIL LIMITATION RATINGS FOR
LOCAL ROADS AND STREETS

Item affecting use	DEGREE OF SOIL LIMITATION		
	Slight	Moderate	Severe
Soil drainage class 1/	Excessively drained, somewhat excessively drained, well drained and moderately well drained	Somewhat poorly drained	Poorly drained and very poorly drained
Flooding	None	Soils flooded less than once in 5 yrs.	Soils flooded more than once in 5 yrs.
Slope	0-8 pct	8-15 pct	More than 15 pct
Depth to bedrock 2/	More than 40 in.	20-40 in.	Less than 20 in.
Subgrade 3/ AASHO group index 4/ Unified soil group	0-4 GW, GP, SW, SP, GM, GC 5/, SM 5/, SC 5/	5-8 CL with PI 6/ less than 15	More than 8 CL with PI 6/ 15 or more, CH, MH 7/, OH, OL, Pt
Shrink-swell potential	Low	Moderate	High
Susceptibility to frost action 8/	Low	Moderate	High
Stoniness class 9/	0, 1 and 2	3	4 and 5
Rockiness class 9/	0	1	2, 3, 4 and 5

1/ For class definitions see Soil Survey Manual, pp. 169-172.

2/ If bedrock is soft enough so that it can be dug with light power equipment and is rippable by machinery, reduce limitation ratings of moderate and severe by one step.

3/ Use AASHO Group Index values if available from laboratory tests; otherwise use the estimated Unified soil groups.

4/ Use Group Index values according to AASHO Designation M 145-49 and M 145-661; for most soils with group index values below about 8, both designations (method) give results nearly enough alike to be considered alike for the purpose of this guide.

5/ Downgrade limitation rating to moderate if content of fines is more than about 30%.

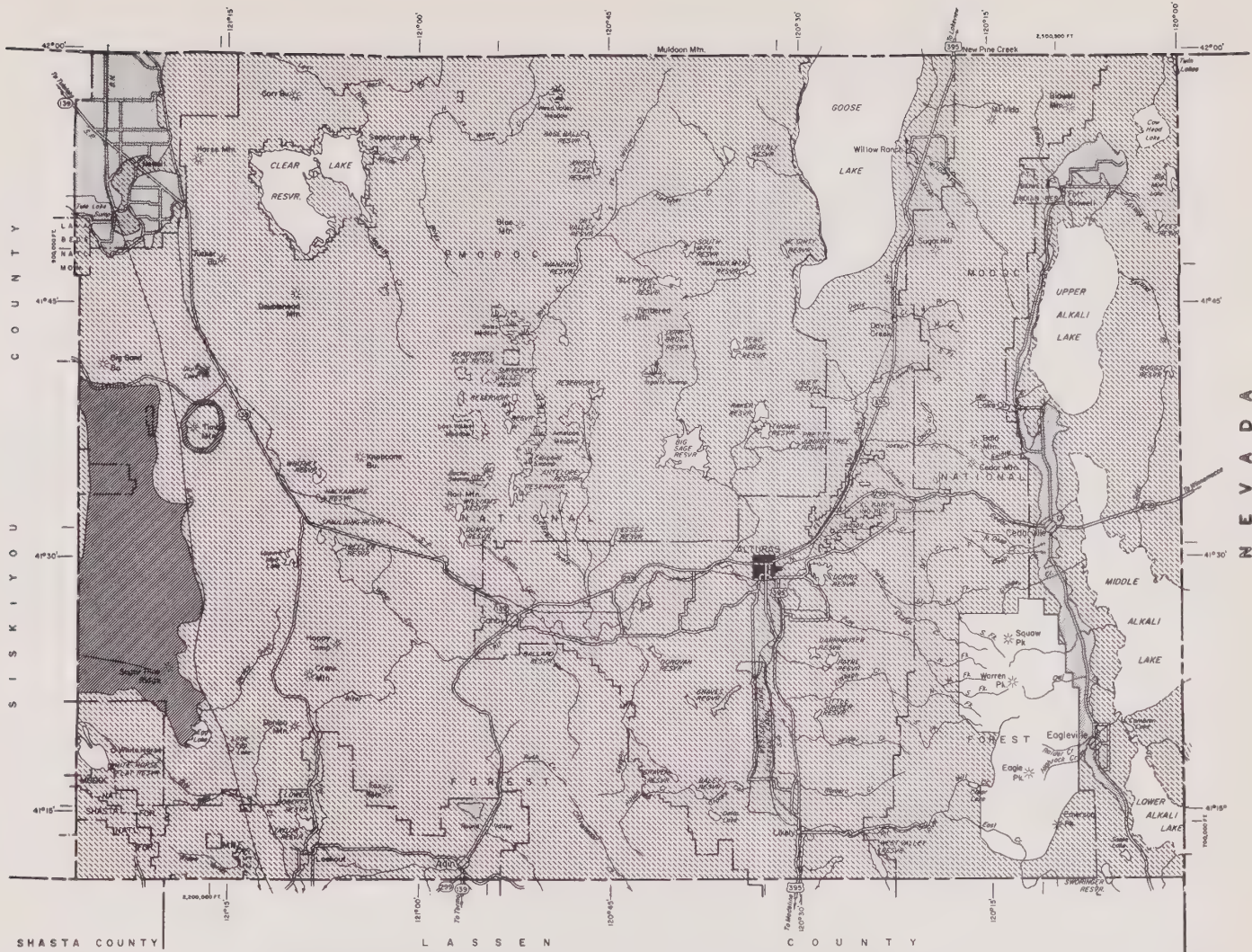
6/ PI means plasticity index.

7/ Upgrade limitation rating to moderate if MH is largely kaolinitic, friable, and free of mica.

8/ Use this item only where frost penetrates below the paved or hardened surface layer and where moisture transportable by capillary movement is sufficient to form ice lenses at the freezing front. See section "Potential Frost Action" for guidance in determining classes.

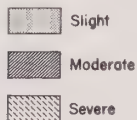
9/ For class definitions see Soil Survey Manual, pp. 216-223.

OREGON



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT. GRID.

SOIL LIMITATIONS FOR ROADS



Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association; otherwise the most extensive limitation is shown.

"Criteria used is from Soils Memorandum 45 (Rev. 2)
Soil Interpretations for Engineering, January 1972."

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SOIL LIMITATIONS FOR ROADS MODOC COUNTY CALIFORNIA

ADIN-LOOKOUT, CENTRAL MODOC, GOOSE LAKE, LAVA BEDS,
AND SURPRISE VALLEY RESOURCE CONSERVATION DISTRICTS,
PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE,
SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLANNING
COMMISSION, MODOC COUNTY, CALIFORNIA

MARCH 1973

5 0 5 10 MILES

TABLE 12 - SUITABILITY RATINGS OF SOILS
AS SOURCES OF ROAD FILL

Item affecting use 1/		DEGREE OF SOIL SUITABILITY		
		Good	Fair	Poor
Engineering soil class	Unified soil groups	GW, GP, SW, SP, GC <u>2/</u> , SM <u>2/</u> , SC <u>2/</u>	ML, CL with PI <u>3/</u> less than 15 pct	CL with PI <u>3/</u> more than 15 pct CH, MH <u>4/</u> OL, OH, Pt <u>—</u>
	AASHTO group index <u>5/</u>	0-4	5-8	More than 8
Shrink-swell potential		Low	Moderate	High
Susceptibility to frost action <u>6/</u>		Low	Moderate	High
Slope		0-15 pct	15-25 pct	More than 25 pct
Stoniness class <u>7/</u>		0, 1 and 2	3	4 and 5
Rockiness class <u>7/</u>		0 and 1	2	3, 4 and 5
Soil drainage class <u>8/</u>		Excessively drained to moderately well drained	Somewhat poorly drained	Poorly drained and very poorly drained

- 1/ The first three items pertain to soil after it is placed in a fill; the last four items pertain to soil in its natural condition before excavation for road fill.
- 2/ Downgrade suitability rating to fair if content of fines is more than about 30%.
- 3/ PI means plasticity index.
- 4/ Upgrade suitability rating to fair if MH is largely kaolinitic, friable and free of mica.
- 5/ Use AASHTO group index only where laboratory data are available for the kind of soil being rated; otherwise use Unified soil groups.
- 6/ Use this item only where frost penetrates below the paved or hardened surface layer and where moisture transportable by capillary movement is sufficient to form ice lenses at the freezing front. See section "Potential Frost Action" for guidance in determining classes.
- 7/ For class definitions see Soil Survey Manual, pp. 216-223.
- 8/ For class definitions see Soil Survey Manual, pp. 169-172.

SOIL LIMITATION FOR UNCOATED STEEL

The corrosion of uncoated steel, such as uncoated steel pipe, is a physical-biochemical process that converts iron into its ions.

Before corrosion can take place, soil moisture is needed to form solutions of soluble salts. Any factors that influence the soil solution or the oxidation-reduction reactions taking place in the soil also influence the operation of the corrosion cell. Some of these factors are: the amount of soil-moisture content, the conductivity of soil solution, the hydrogen ion activity of the soil solution (ph), the oxygen concentration (aeration) and the activity of organisms capable of causing oxidation-reduction reactions.

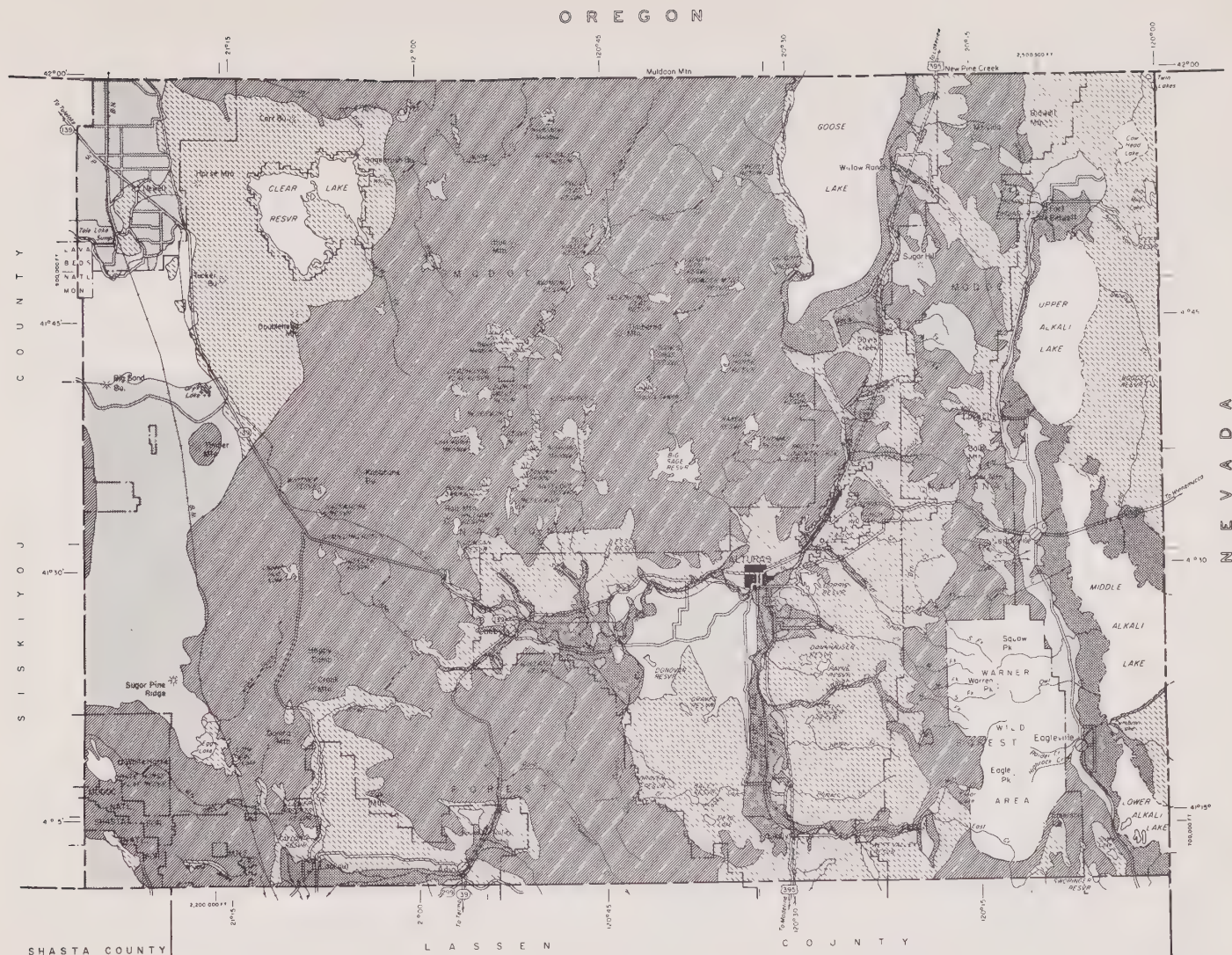
The estimation of corrosivity for untreated steel pipe is commonly based on: (1) resistance to flow of electrical current; (2) total acidity; (3) soil drainage; (4) soil texture and (5) conductivity of saturation extract.

Soils generally are assigned to one of three classes of corrosivity: low, moderate and high.

Low: Generally includes well drained soils that have a moderately coarse textured and medium textured control section and somewhat poorly drained soils that have a coarse textured control section. The soils are moderately permeable to rapidly permeable. The total acidity is below 8.0 meq per 100 g of soil, or electrical resistivity at moisture equivalent is above 5,000 ohm-cm at 60°F., or electrical conductivity of the saturation extract is less than 0.2 mmho per centimeter at 25°C.

Moderate: Generally includes well drained soils that have a moderately fine textured control section and moderately well drained soils that have a medium textured control section. Also included are somewhat poorly drained soils that have a moderately coarse textured control section, and very poorly drained soils, including peats and mucks, in which the water table remains at the surface throughout the year. Permeability is moderately slow to slow. The total acidity ranges from 8.0-12.0 meq per 100 g of soil, or electrical resistivity at moisture equivalent is 2,000 to 5,000 ohm-cm at 60°F., or electrical conductivity of the saturation extract is 0.2 to 0.4 mmho per centimeter at 25°C.

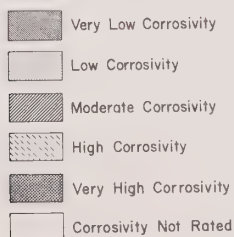
High: Generally includes well drained and moderately well drained, fine textured soils; moderately well drained, moderately fine textured soils; somewhat poorly drained soils that have medium textured and moderately fine textured control sections; and poorly drained soils that have coarse textured control sections. Very poorly drained soils are included where the water table fluctuates within one foot of the surface sometime during the year. The total acidity is greater than 12.0 meq per 100 g of soil, or electrical resistivity at moisture equivalent is below 2,000 ohm-cm at 60°F., or electrical conductivity of the saturation extract is greater than 0.4 mmho per centimeter at 25°C.



CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT GRID



CORROSIVITY FOR UNTREATED STEEL PIPE



Line between areas of different corrosion levels is shown. The area between the line and the boundary of the county is not shown. The area between the line and the boundary of the county is not shown.

Each area outlined on this map consists of more than one 1/4 section. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

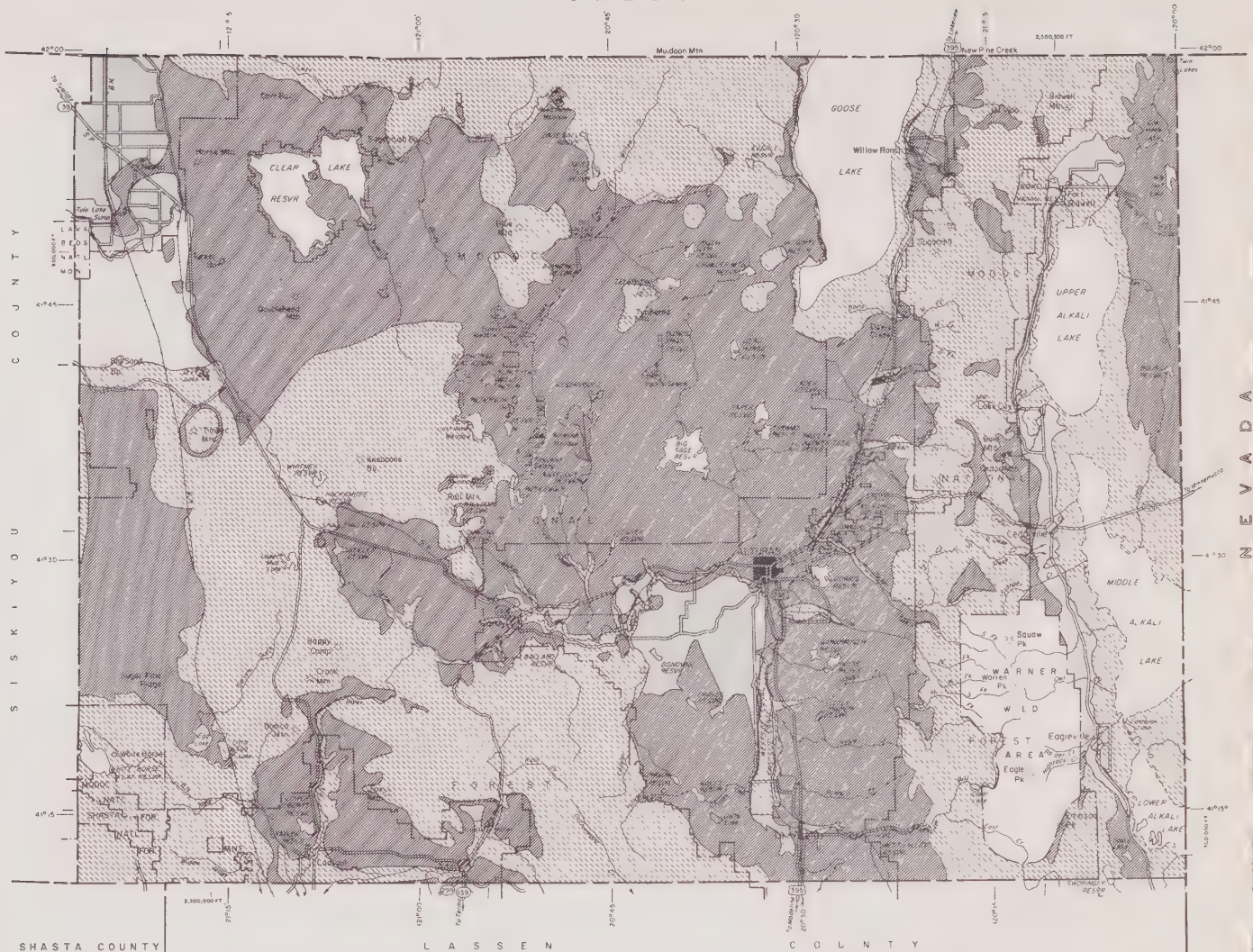
CORROSIVITY FOR UNTREATED STEEL PIPE MODOC COUNTY CALIFORNIA

ADAPTED FROM CENTRAL MAPPING COMPANY, ALABAMA
AND AGRICULTURAL RESEARCH SERVICE
PREPARED BY THE MODOC COUNTY DISTRICT
COUNTY ENGINEER, CENTRAL MAPPING COMPANY, ALABAMA

MARCH 1973





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CALIFORNIA PLANE COORDINATE SYSTEM
ZONE 1, 100,000 FT GRID

LEGEND

-  Low Potential
-  Moderate Potential
-  High Potential
-  Potential Not Rated



Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association, otherwise the most extensive limitation is shown.

*Criteria used is from Soil Memorandum 45 (Rev. 2) Soil Interpretations for Engineering, January 1972.

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LIMITATIONS FOR FROST HEAVE POTENTIAL
MODOC COUNTY
CALIFORNIA

ADIN-LOOKOUT, CENTRAL MODOC, GOOSE LAKE, LAVA BEDS AND SURPRISE VALLEY RESOURCE CONSERVATION DISTRICTS
PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLANNING COMMISSION, MODOC COUNTY, CALIFORNIA

MARCH 1973

5 0 5 10 MILES

LIMITATION DUE TO
POTENTIAL FOR FROST ACTION

(Frost Heave)

Potential frost action refers to the probable effects on structures resulting from the freezing of soil material and its subsequent thawing. These probable effects are important factors mainly in selecting sites for highways and runways but also are of importance in planning any structures that are to be supported or abutted by soil that freezes. The action not only pertains to the heaving of soil as freezing progresses but also to the excessive wetting and loss of soil strength during thaw.

Damage to structures from frost action results not from the freezing of the soil itself but from the formation of ice lenses in the soil. In turn, the formation of ice lenses depends on capacity of the soil to deliver water to a stationary or slowly moving freezing front.

Potential for Frost Action

The three classes of potential are based on USDA soil texture classes or on classes in the Unified system. The classes listed below should be used with the understanding that the best evidence is gotten from observations made in the field and from data used in classifying and mapping soils in published soil surveys. Although grain size is obviously an important factor in frost action, it is not the only property that influences the action. Of importance also are soil structure and porosity and other properties that affect capillary conductivity and the scarcity or abundance of soil moisture during freezing weather.

The three classes of potential based on USDA textures are:

<u>Low:</u>	<u>Moderate:</u>	<u>High:</u>
Sand	Clay	Silt
Loamy sand	Silty clay	Silt loam
Coarse sandy loam	Sandy loam (medium)	Silty clay loam
	Sandy clay loam	Loam
	Sandy clay	Clay loam
		Very fine sandy loam
		Fine sandy loam

Gravel and other coarse fragments in soils tend to reduce the potential of frost action.

Most of the bottomland soils in Modoc County have moderate to high potential for frost action since they have mostly loamy and clayey textures. Foothill soils vary from low to high, with the moderate limitation predominating. Mountainous soils have a moderate to high limitation.

DISCUSSION

County-Wide Issues

1. At the present time, soils and related conditions are not an integral part of the land use determination process. For example, in some cases urban uses have infringed upon the most valuable croplands within the county. These croplands are an integral part of the county-wide agricultural picture and as such should be spared from urban use.
2. Erosion and sedimentation are the largest pollutants in Modoc County. Erosion of slopes in excess of 25 percent from building and road construction is an extreme example of the major pollutant in watersheds. Channel modifications in streams and rivers have been made which increase rate of flow, rate of sediment transport, erosive capacity, have general adverse effect on aquatic life, or modify necessary groundwater recharge.

Recommendations

1. It is recommended that soils characteristics should become a part of the determining factors of land use. Urban uses should be permitted on crop lands only when they are located within the immediate spheres of influence around each community in the county.
2. Standards should be adopted which will be applicable to all types of man-made disruption of soils and subsurface geologic features in order to minimize erosion and sedimentation problems. Building and road construction on slopes of more than 25 percent should be discouraged and development proposals on slopes of 5 to 25 percent should be required to be accompanied by plans for control or prevention of erosion, alteration of surface water runoff, and increase of soil slippage. Channel modification should be discouraged.

Vegetation

NATURE IS CONSTANTLY STRIVING TO DEVELOP AND MAINTAIN A BALANCE OF PLANT AND ANIMAL LIFE WITH MODIFICATIONS RESULTING FROM ELEVATION, CLIMATE, SOIL AND OTHER FACTORS. MODOC COUNTY HAS AN EXTREMELY VARIED NATIVE FLORA BECAUSE OF THE WIDE DIFFERENCES IN GROWING CONDITIONS.

VEGETATION

The principal vegetative cover types in Modoc County are the Northern Desert Shrub type, the Coniferous Forest type and the Juniper-Sagebrush type. Minor types, found scattered throughout the county are: the Grass and Forb type, the Chaparral and Mountain Brush type and the Hardwood Forest type. The map found on page 58 shows the general location of the three major types.



The dominant plants in the Northern Desert Shrub type are Big sagebrush, Black sagebrush, Antelope bitterbrush, several wheatgrasses, bluegrasses and various annual grasses and forbs. Scattered Juniper and other evergreen often occur on this type.

The Coniferous Forest type is dominated by Ponderosa pine and White fir with an understory of smaller trees, various brush, grass and forb species.





GENERAL DISTRIBUTION OF
MAJOR
VEGETATIVE TYPES
MODOC COUNTY

KEY

C = Coniferous Forest Type
D = Northern Desert Shrub Type
J = Juniper-Sagebrush Type



The Juniper-Sagebrush type is dominated by Western juniper with an understory of brush, grass and forb species.

NATIVE FLORA OF MODOC COUNTY (a partial list)

GRASSES AND GRASSLIKE

<i>Agropyron spicatum</i>	Bluebunch wheatgrass
<i>A. Smithii</i>	Western wheatgrass
<i>A. trachycaulum</i>	Slender wheatgrass
<i>Agrostis alba</i>	Redtop
<i>Bromus braezaformis</i>	Rattlesnake brome
<i>B. carinatus</i>	Mountain (California) brome
<i>B. marginatus</i>	Woodland (mountain) brome
<i>B. japonicus</i>	Japanese brome
<i>B. tectorum</i>	Cheatgrass brome
<i>Calamagrostis rubescens</i>	Pinegrass
<i>Carex</i> spp.	Sedge
<i>Danthonia unispicata</i>	One-spike outgrass
<i>Deschampsia elongata</i>	Hairgrass
<i>Distichlis</i> spp.	Saltgrass
<i>Eleocharis</i> spp.	Spikerush
<i>Elymus-medusea</i>	Medusahead
<i>E. cenerius</i>	Great Basin wildrye
<i>E. glaucus</i>	Blue wildrye
<i>E. triticoides</i>	Beardless wildrye
<i>Festuca idahoensis</i>	Idaho fescue
<i>F. ovina</i>	Sheep fescue
<i>Hordeum nodosum</i>	Meadow barley
<i>Juncus</i> spp.	Rushes
<i>Koeleria cristata</i>	June grass
<i>Melica fugax</i>	Onion grass

GRASSES AND GRASSLIKE, Continued

<i>Muhlenbergia squarrosa</i>	Mat muhly
<i>Phleum alpinum</i>	Alpine timothy
<i>Poa nevadensis</i>	Nevada bluegrass
<i>P. secunda</i>	Sandberg's bluegrass
<i>Scirpus</i> spp.	Bullrush
<i>Sitanion hystrix</i>	Squirreltail
<i>Stipa columbiana</i>	Columbia needlegrass
<i>S. comata</i>	Needle and thread
<i>S. occidentalis</i>	Western needlegrass
<i>S. thurberiana</i>	Thurber's needlegrass

FORBS

<i>Achillea lanulosa</i>	Western yarrow
<i>Agoseris</i> spp.	Mountain dandelion
<i>Allium</i> spp.	Wild onion
<i>Amsinkia douglasiana</i>	Fiddleneck
<i>Anaphalis margaritacea</i>	Pearly everlasting
<i>Antennaria</i> spp.	Pussytoes
<i>Apocynum</i> spp.	Dogbane
<i>Arnica</i> spp.	-----
<i>Artemesia gnaphaloides</i>	Wormwood
<i>Aster</i> spp.	Aster
<i>Astragalus</i> spp.	Locoweed
<i>Balsamorhize hookeri</i>	Balsam root
<i>B. sagittata</i>	Arrowleaf balsam root
<i>Brassica campestris</i>	Yellow mustard
<i>Camassia quamash</i>	Common camas
<i>Castilleja</i> spp.	Indian paintbrush
<i>Cerastium arvense</i>	Chickweed
<i>Chaenactis douglasii</i>	-----
<i>Chenopodium album</i>	Lambsquarter
<i>Cirsium</i> spp.	Thistle
<i>Crepis occidentales</i>	Tapertip hawksbeard
<i>Cryptantha hendersonii</i>	Cryptantha
<i>Delphinium</i> spp.	Larkspur
<i>Dodecatheon</i> spp.	Shooting star
<i>Epilobium angustifolium</i>	Fireweed
<i>Erigeron</i> spp.	Daisy
<i>Erigonum</i> spp.	Buckwheat
<i>Eriophyllum lanatum</i>	-----
<i>Erodium cicutarium</i>	Redstem alfilaria
<i>Fragaria</i> spp.	Strawberry
<i>Galium boreale</i>	Northern bedstraw
<i>Geranium</i> spp.	Geranium
<i>Gilia</i> spp.	Gilia
<i>Goodyera decipiens</i>	Western rattlesnake plantain
<i>Hemizonia</i> spp.	Tarweed
<i>Hieracium horridum</i>	Wooly weed hawkweed
<i>Hydrophyllum capitatum</i>	Ballhead waterleaf
<i>Lactuca seriola</i>	Prickly lettuce
<i>Lilium</i> spp.	Lily

FORBS, Continued

<i>Lotus</i> spp.	Deer vetch
<i>Lupinus</i> spp.	Lupines
<i>Madia</i> spp.	Tarweed
<i>Marrubium vulgare</i>	Common hoarhound
<i>Mentha candanesis</i>	Mint
<i>Mertensia</i> spp.	Bluebell
<i>Mimulus</i> spp.	Monkey flower
<i>Montia</i> spp.	Miners' lettuce
<i>Nicotiana</i> spp.	Wild tobacco
<i>Oenothera</i> spp. (<i>Taraxia</i>)	Evening primrose
<i>Paeonia brownii</i>	Peony
<i>Penstemon</i> spp.	Beard tongue
<i>Phacelia</i> spp.	-----
<i>Phlox</i> spp.	Phlox
<i>Plantago</i> spp.	Plantain
<i>Potentilla</i> spp.	Five fingers
<i>Ranunculus</i> spp.	Buttercup
<i>Rumex acetosella</i>	Sheep sorrel
<i>R. venosus</i>	Sout dock
<i>Salsola kali tenuifolia</i>	Russian thistle, tumbleweed
<i>Sanicula</i> spp.	Sanicle
<i>Saxifraga</i> spp.	Saxifrage
<i>Senecio columbianus</i>	Ragwort, groundsel
<i>Sidalcea</i> spp.	Checker bloom
<i>Sperigula</i> spp.	Corn spurrey
<i>Suaeda depressa</i>	Pahute weed
<i>Taraxacum officionale</i>	Dandelion
<i>Thalictrum occidentale</i>	Western meadowrue
<i>Trifolium</i> spp.	Clover
<i>Veratrum californicum</i>	False hellebore
<i>Verbascum thapsus</i>	Common mullein
<i>Vicia</i> spp.	Vetch
<i>Viola</i> spp.	Pansy
<i>Wyethia mollis</i>	Wooly mule's ear
<i>Zygadenus</i> spp.	Death camas

TREES AND SHRUBS

<i>Abies concolor</i>	White fir
<i>A. magnifica</i>	Red fir
<i>Amalanchier alnifolia</i>	Serviceberry
<i>Arctostaphylos patula</i>	Greenleaf manzanita
<i>Artemesia arbuscula</i>	Little black sagebrush
<i>A. a. nova</i>	Black sagebrush
<i>A. cana</i>	Silver sagebrush
<i>A. tridentata</i>	Big sagebrush
<i>Atriplex</i> spp.	Saltbush
<i>Ceanothus prostratus</i>	Squaw carpet
<i>C. velutinus</i>	Snowbrush, tobacco brush
<i>Cercocarpus ledifolius</i>	Long-leaf mountain mahogany

TREES AND SHRUBS, Continued

<i>Chamaebatia foliolosa</i>	Mountain misery
<i>Chamaebatiaria millefolium</i>	Fern bush, desert sweet
<i>Chrysothamnus nauseosus</i>	Rubbery rabbitbrush
<i>C. viscidiflorus</i>	Douglas rabbitbrush
<i>Eriophyllum lanatum</i>	Oregon sunshine
<i>Grayia spinosa</i>	Spiny hopsage
<i>Haplopappus</i> spp.	Goldenbush
<i>Holodiscus discolor</i>	Creambush rockspirea
<i>Juniperus occidentalis</i>	Western juniper
<i>Libocedrus decurrans</i>	Incense cedar
<i>Peraphyllum ramosissimum</i>	Squawapple
<i>Pinus contorta</i>	Lodgepole pine
<i>P. jeffreyi</i>	Jeffrey pine
<i>P. ponderosa</i>	Ponderosa pine, yellow pine
<i>Populus tremuloides</i>	Quaking aspen
<i>Prunus demissa</i>	Western chokecherry
<i>P. emarginata</i>	Bittercherry
<i>P. subcordata</i>	Sierra plum
<i>Purshia tridentata</i>	Bitterbrush
<i>Quercus</i> spp.	Oak
<i>Ribes</i> spp.	Currant, gooseberry
<i>Rosa</i> spp.	Greasewood
<i>Sacrobatus</i> spp.	Wild rose
<i>Salix</i> spp.	Willow
<i>Sambucus caerulea</i>	Blue elderberry
<i>Spirea lucida</i>	Shinyleaf spirea
<i>Symphoricarpos albus</i>	Common snowberry
<i>Tetradymia canescens</i>	Gray horsebrush

Plant list extracted from Stechman, John V., "A Study of Forage Production-Thoms Creek Allotment", USFS "Interstate Winter Range Survey", and SCS "Surprise Valley-Home Camp Soil Survey Manuscript". Plant list includes some introduced species that have evidently occupied a niche in certain plant communities.

RARE AND ENDANGERED PLANT SPECIES

At present, there has been no real attempt to identify and protect rare and endangered species of vegetation. There are some areas where a program of identification and management might be beneficial to the general environment, but great caution must be exercised when contemplating any such program.

Often a species will disappear as part of the natural selection process and not in response to man's inroads on the natural environment. Those species which are of state, national or local significance which are disappearing from the county should be examined and recommendations on their desired subsequent condition acted on.

Generally, there are some areas of importance as natural areas and should be preserved. The Warner wilderness area contains many representative examples of native flora which can be utilized by many if properly allocated. Other areas, primarily on public lands, have areas of natural significance to the general public and policies and programs effecting these areas rest with the land administering agency.

The California Native Plant Society lists the following species as rare and/or endangered and indicate that they are found in Modoc County:

<i>Agastache parvifolia</i>	A Giant hyssop
<i>Calochortus longebarbatus</i>	A Long hair mariposa lily
<i>Carex whitneyi</i>	A Sedge
<i>Cryptantha subretusa</i>	A Nievitas
<i>Erigonum prociduum</i>	A Buckwheat
<i>Mimulus pygmaeus</i>	A Monkey flower
<i>Penstemon cinicola</i>	A Ashy penstemon
<i>Poa fibrata</i>	A Bluegrass

DISCUSSION

County-Wide Issues

1. The erosion and sedimentation process is a result of both man and natural phenomena and can be controlled only partially by land management programs and by ordinance. Natural phenomena should be examined in the light of what benefits can be derived at what costs (monetarily and environmentally) if enhancement programs are considered. Some beneficial changes can be made in the area of erosion control, but these controls may not serve the purpose if natural processes are abridged by man-induced changes.
2. The lack of knowledge on plant species of rare or endangered condition in Modoc County will not be hard to overcome and may provide some aesthetic and scientific benefits.

Recommendations

1. It is recommended that the principal area of erosion control rest with the individual landowner and those agencies which have jurisdiction from federal and state levels.

The county can assist by:

- a. Providing a grading ordinance which will effectively control vegetative cover removal in private and public projects.
 - b. Promoting the legislative means of developing funding for erosion control.
2. It is recommended that local, state and federal agencies examine those species which are on the decline in Modoc County which may also be declining state or nation wide. A full assessment of the processes involved may yield valuable scientific knowledge.

Wildlife

A WILDLIFE POPULATION IS DIRECTLY
DEPENDENT UPON THE CONDITION AND
EXTENT OF ITS HABITAT. WITHOUT
FOOD, WATER AND COVER, WILDLIFE
CANNOT EXIST.

WILDLIFE

One of the chief attractions of Modoc County is its wide variety and abundance of wildlife. Wildlife is a product of the land and can remain viable only as long as there is suitable habitat.

Although the responsibility for protection and management of the wildlife rests with the California Department of Fish and Game and the United States Fish and Wildlife Service, the land is managed, for the most part, by private individuals, the United States Forest Service and the United States Bureau of Land Management. The county can assist in preserving and enhancing wildlife by recognizing wildlife as a valuable resource to the county, state and nation. It is easy for those who live in day-to-day contact with wildlife to become complacent about its needs and values. The county should endeavor to educate and increase the awareness of the public, as well as land managers, as to the need for the maintenance of the varied wildlife and habitat within the county.

BIG GAME

Deer - *Odocoileus hemionus*

Deer are the most abundant big game animal in Modoc County. Virtually the entire county is deer range. There are two subspecies of deer found within the county. The Rocky Mountain Mule Deer is the most abundant and is found county-wide. Found in lesser numbers in the western part of the county is the Columbian Black-Tailed Deer. The deer herds are migratory, ranging to lower elevations in winter. However, deer can be found throughout the county during normal snow-free periods. The Devils Garden area provides a winter range for a deer herd which summers in Oregon.

As with all forms of wildlife, food, water and cover in an acceptable arrangement are the essential environmental elements necessary for the maintenance of a deer herd. In Modoc County cover and water supplies, in general, are adequate. However, they may at times become a localized problem. The controlling element of the deer herds in Modoc County is the food supply.

Snows at higher elevations usually force deer to migrate to winter ranges at lower elevations. As these winter ranges receive less precipitation there is less forage produced than at higher elevations. Deer are forced to concentrate on available forage. As a result, deer winter ranges are the key factor in the maintenance of the deer populations. Most winter ranges are grazed by livestock as well as deer. Deer winter ranges are located on both public and private land and are shown on the map following page 66.



Antelope - Antilocapra Americana

On the pristine grasslands of California antelope were the most abundant big game species. The historic range of antelope included the central valleys, the southern deserts, the Inyo-Morro area and the plateau areas of northeastern California. As a result of environmental changes such as agricultural, industrial and urban development, antelope range in California has been severely restricted. Today California's antelope populations are located on limited habitat in the northeastern corner of the state. Antelope ranges and migration routes are shown on the map following page 68.

Although antelope numbers are limited, this is the second most abundant big game animal in Modoc County and is high in aesthetic and hunter interest. The January 1973 antelope census revealed a population of 2,734 animals in Modoc County. The antelope population in Modoc County has increased by 162 percent since 1957, the low population year in recent times. However, this has not been a steady increase and there have been fluctuations in antelope numbers. Although the fluctuations as well as the increase in antelope numbers cannot be fully explained, it must be realized that the antelope population is directly related to the quality and quantity of the environment.



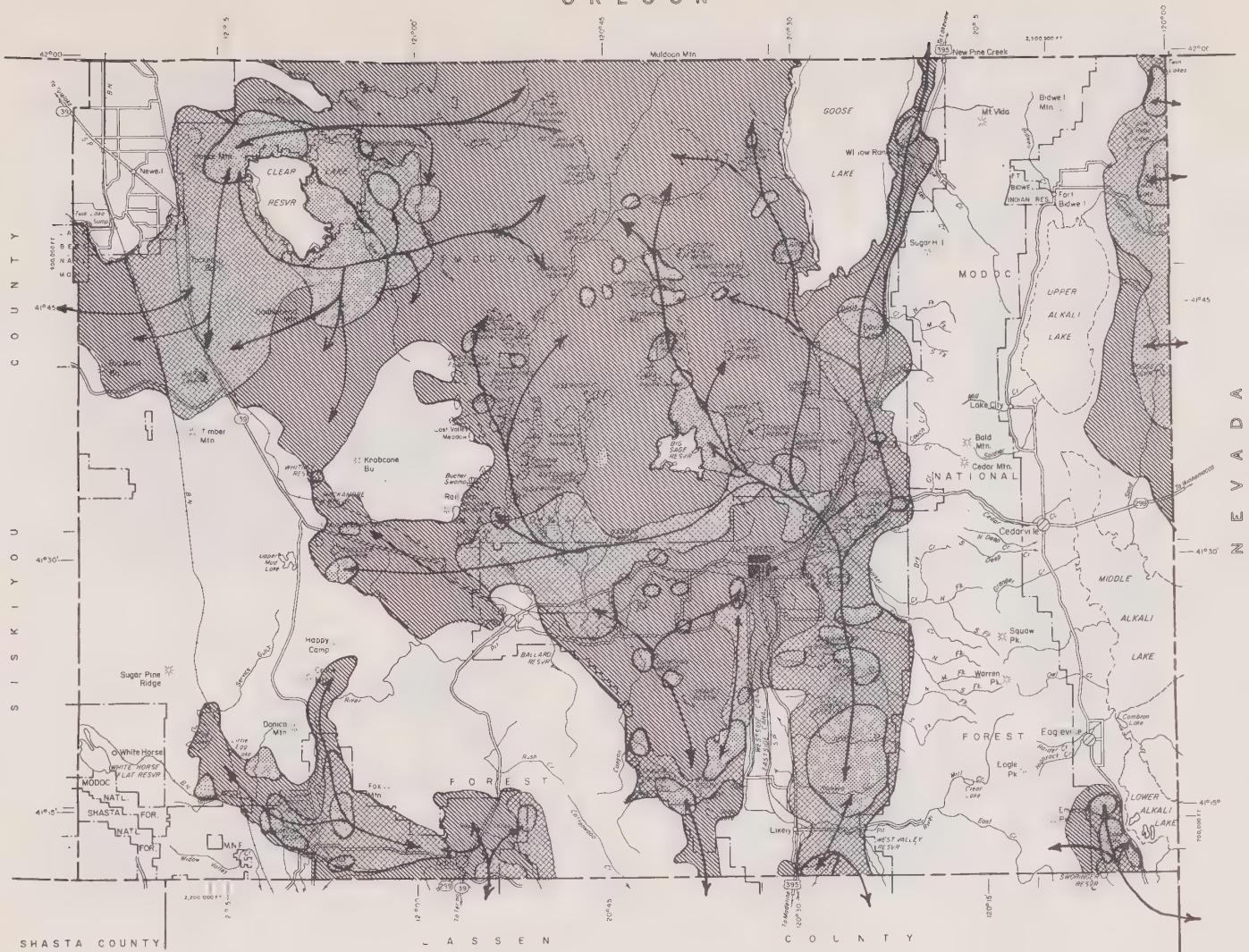
The antelope is a unique animal and as such has specialized environmental requirements. Among these requirements are:

1. Relatively flat unobstructed open rangeland.
2. A variety of forbs, grasses and browse plants for forage.
3. Relatively easy access to water.
4. Unobstructed migration routes between summer and winter ranges.
5. Freedom of access to ancestral kidding areas.
6. Adequate cover.

Antelope are extremely nervous animals and are highly susceptible to stress factors. Antelope in general do not react favorably to contact with man or his works.

Bear - Ursus Americanus

The Sierra Nevada Black Bear is the only species of bear living in Modoc County. The bear population exists in comparatively low numbers. Hunters have reported taking a total of 25 bears in the past 16 years. The quantity and quality of the habitat is the limiting factor of the bear population. Bear hunting offers very little in the way of recreational opportunity in Modoc County.



ANTELOPE

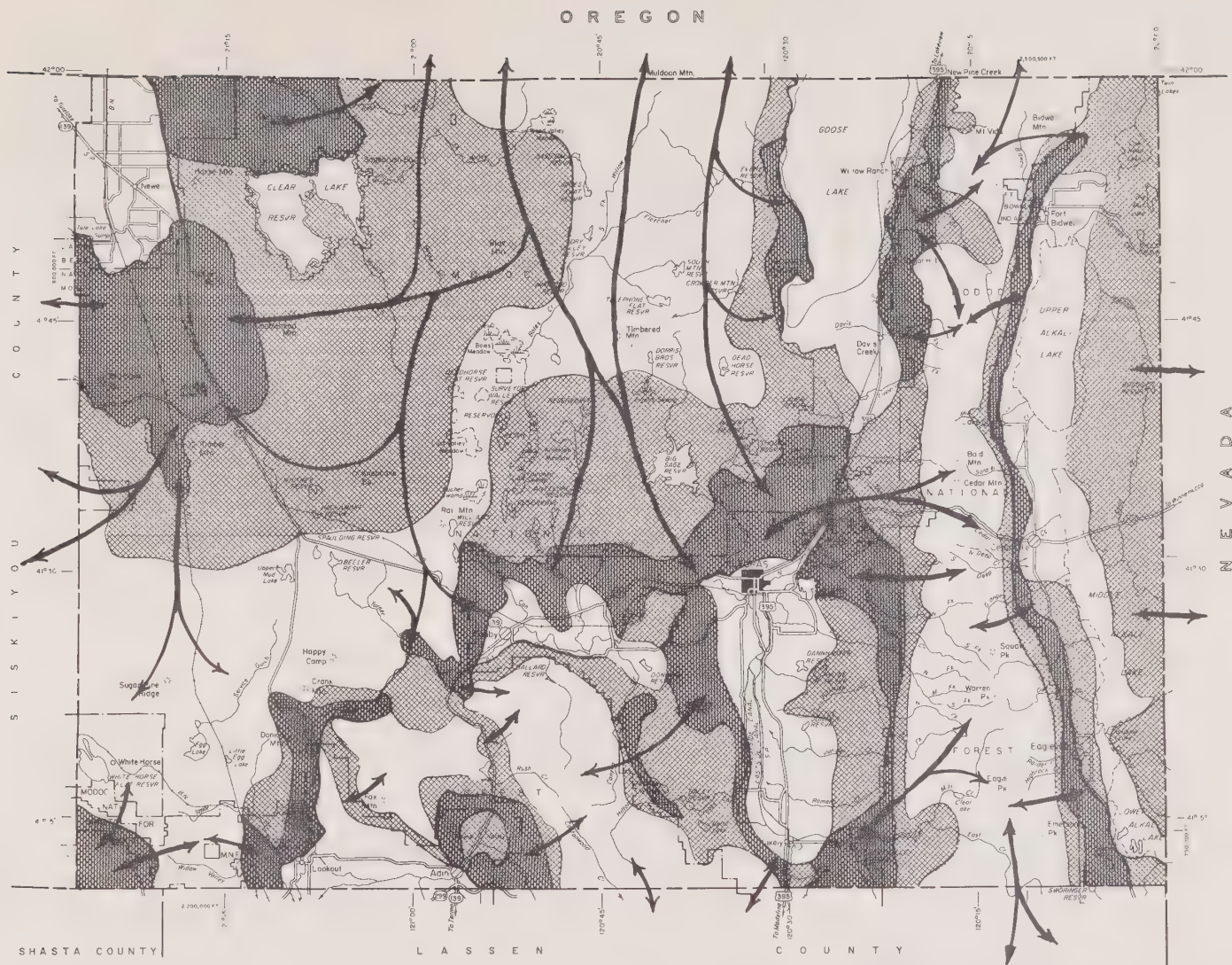
- Summer Range
- Winter Range
- Kidding Grounds
- Migration Patterns

ANTELOPE
MODOC COUNTY
CALIFORNIA

APRIL 1972

5 0 5 10 MILES
SCALE 1:253,440

Data from California Department of Fish & Game



DEER

- Winter Range
- Critical Winter Range
- Migration Patterns



Data from California Department of Fish & Game

DEER MODOC COUNTY CALIFORNIA

APRIL 1972

0 5 10 MILES
SCALE 1:253,440

In past years there has been very limited conflict between man and bear within the county. However, with the increase in subdivision activities and summer home construction conflicts can be expected to increase. Bears are a part of the outdoors and can be enjoyed as such. Conflicts with man can be minimized if homeowners are informed of safeguards and the consequences of improper sanitation. Complaints of bear depredation can best be handled on an individual basis and are the responsibility of the California Department of Fish and Game.

Mountain lion - Felis concolor

Mountain lion are present in Modoc County, however numbers are limited. The mountain lion is classed as a game animal in California. There is currently a moratorium of killing mountain lions in the state. Lions can be killed if depredations to livestock occur under provisions of the Fish and Game Code. There is currently under way in this state a study designed to learn more of the population densities and habits of the mountain lion. The principal food of mountain lions is deer. Although the lion population is limited, they will continue to exist as long as there are deer populations to support them.

FURBEARERS AND MAMMALIAN PREDATORS

The more prominent furbearers found within the county include muskrat, beaver, mink, badger, skunk, raccoon and weasel. Coyotes and bobcats are also taken extensively for fur when prices are high, but they are primarily significant as predators.

Furbearers provide an economic resource through commercial fur trapping. Muskrat and beaver are the most sought after of the furbearers. The amount of economic return to the county is proportional to prices paid for furs. High fur prices stimulate commercial trapping activity.

The furbearers are predators or rodents. Furbearers in general require heavy cover for concealment. There has been a shrinkage of habitat as a result of clean farming operations and the removal of riparian growth from stream sides. The problems concerned with the preservation of habitat for other forms of wildlife apply equally to furbearers. In other words, good quail, pheasant, rabbit or waterfowl habitat is good furbearer habitat.

Problems associated with furbearers are usually raids on domestic fowl, burrowing in dams and levees by muskrats and damming of ditches, culverts, etc. by beavers. These problems are best handled by removal of the offending individuals. The regular trapping of beavers and muskrats during the season can aid in minimizing damage in chronic problem areas.

The primary mammalian predators are the coyote and bobcat. They can be found county-wide. They are essentially carnivorous and often prey on game species or domestic livestock.

UPLAND GAME

Ring-Necked Pheasant - *Phasianus colchicus*

This species at one time had high density populations in localized areas of the county. The pheasant population is dependent upon the type of agriculture operations carried on in a given area with the highest populations being found on irrigated farm lands.

Quail - *Oreortyx pictus* and *Lophortyx californicus*

Mountain quail were at one time relatively numerous in localized areas of the county. There has been a marked decline in mountain quail numbers over the years. The exact reason for the decline is unknown. This species migrates to lower elevations in winter where available winter food and cover may be critical factors.

Quail hunting is severely restricted on private land due in part to the high aesthetic value. Many land holders feed quail during winter months and so enjoy the quail they do not want them hunted. Winter feeding of quail does not insure high population levels and, in fact, is an invitation to catastrophic disease epidemics.

Hunting is not the limiting factor on quail populations. Present California quail populations in the county could sustain a much higher level of harvest than is now being carried out. Quail populations densities are related to the quantity and quality of habitat.

Economic benefit to the county can be expanded by hunting club operations on private land. Quail hunting could be offered incidental to hunting such other species as waterfowl or pheasant.

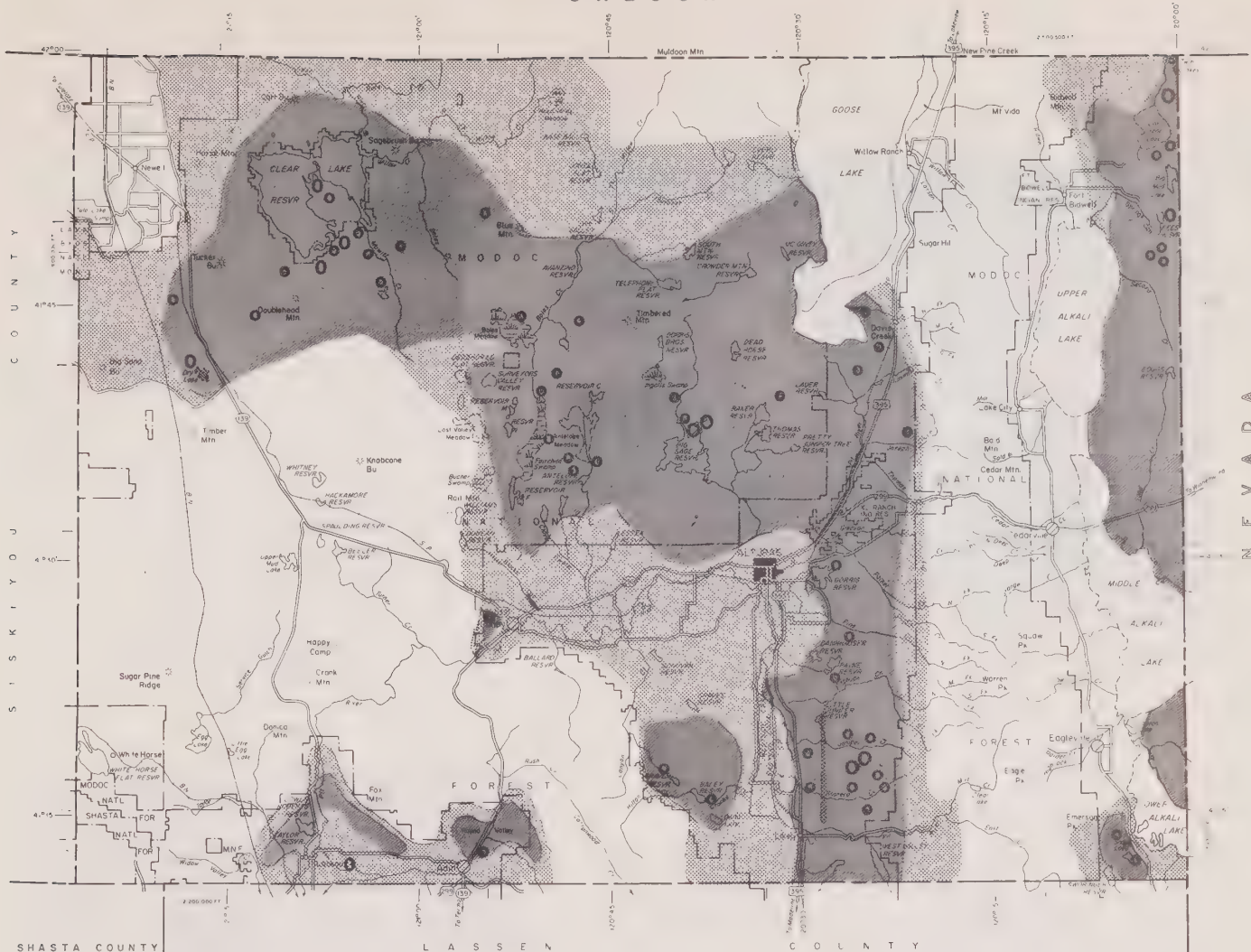
Sierra Grouse - *Dendragapus obscurus*

Sierra grouse are found at the higher elevations of Modoc County in association with fir stands and aspen groves. The controlling factor is the limited amount of suitable habitat. Logging contributes the most change to the habitat but poses no threat as long as operations are controlled. Sierra grouse prefer second growth cover. Since most grouse range is on public land, modern logging practices should be beneficial to the species.

Although there is an annual season open to Sierra grouse, hunting interest is relatively low and little is provided to the economy.

Sage Grouse - *Centrocercus urophasianus*

Modoc County is within the limited range of sage grouse in California. Populations are scattered throughout the relatively flat sagebrush associated areas of the county. The sage grouse exists in huntable populations, however, season lengths and bag limits are limited.



SAGE GROUSE HABITAT

- Areas used year around
- Summer Range
- Known active Strutting Grounds
- Other possible Strutting Grounds

SAGE GROUSE HABITAT
MODOC COUNTY
CALIFORNIA

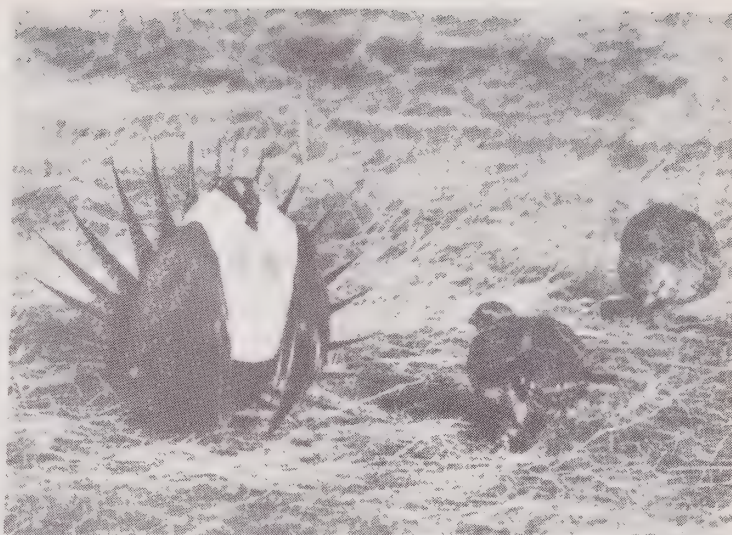
APRIL 1972

Source: California Department of Fish & Game

0 5 10 MILES
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Hunter interest and aesthetic value are high. Most sage grouse hunters are from within the county or from adjacent counties. Hunter interest has shown a slow increase. Hunting is not considered to be the limiting factor on sage grouse populations.

More detailed information is needed on the habitat requirements of sage grouse. Measures should be taken to protect and restore where possible key areas such as springs, meadows and strutting grounds. Until the optimum balance of plant combinations for sagebrush conversions is determined, extreme care should be exercised when planning and implementing such conversions. Areas inhabited by sage grouse are shown on the map following page 72.



Indian Chukar - Alectoris graeca

Chukar are found in limited numbers in the more remote areas of the county. Chukar habitat is characterized by steep, rough, rock mountainous terrain interspersed with grasses, forbs and a limited amount of brush and trees.

The Indian chukar is an introduced species in the county. Suitable habitat is limited and in all probability this species has reached the extent of its range.

Mourning Dove - Zenaidura macroura

The mourning dove is one of the most important upland game species in the state. Modoc County provides an important nesting area for thousands of doves each year. Doves are found in all habitat types during the summer nesting season.

As a migratory species doves are covered by international treaty with Canada and Mexico. This treaty forbids dove hunting before September 1 in the Continental United States. Although the dove is high in hunter demand, the amount of recreation provided in Modoc County is limited. Doves usually begin their southward migration during the latter part of August or the first part of September.

Rabbits - Sylvilagus spp. and Lepus spp.

The five species of rabbits and hares found in Modoc County are: black tailed jackrabbit, white tailed jackrabbit, snowshoe rabbit, cottontail rabbit and pigmy rabbit.

The primary use of the rabbit resource is recreational hunting with cottontails receiving most of the hunting effort. Rabbit hunting does have an economic value to the county. Rabbit hunting opportunities could be offered on gun clubs incidental to waterfowl and/or pheasants.

Rabbit populations are cyclic. During peak population cycles rabbits, especially jackrabbits, can cause considerable damage to cultivated crops. Citizens suffering rabbit damage may eliminate depredating rabbits. If poisons are to be used for rabbit depredation relief, all local, state and federal laws must be complied with.

The retention of enough rabbit habitat for recreational purposes does not appear to be a problem at this time. However, land managers should consider habitat requirements when planning all major land use changes.

Tree Squirrels - Sciurus spp. and Tamiasciurus spp.

There are two species of tree squirrels found in the county in localized populations. These are the western grey squirrel and the chickaree or Douglas squirrel. Due to limited populations, very little hunting effort is expended for squirrel. Positive and/or negative economic values are minimal.

In Modoc County aesthetic value probably exceeds the sporting value.

Hungarian Partridge - Perdix perdix

Hungarian partridges are an introduced species that has not done well in the county. A small population still exists in Surprise Valley. There is no open hunting season on this species. Positive and/or negative economic values are minimal.

WATERFOWL

Modoc County with its complex of lakes, reservoirs, marshes, grass and agricultural land is a high value waterfowl nesting area. This county has the second highest breeding population of waterfowl in the state. The three Alkali Lakes, Goose Lake, the Pit River Valley, Surprise Valley and Big Valley, along with the Tululake, Clear Lake and Modoc National Wildlife Refuges provide excellent waterfowl breeding and nesting areas. At least 23 other locations have been identified as important waterfowl production areas. Waterfowl habitat areas are located on the map following page 78. Breeding ground surveys have shown a minimum average of 2,922 pairs of ducks in the county for the years 1960 through 1969. These same years have shown a minimum average of 9,588 young and adult resident Canada geese.

Modoc County lies on the Pacific Flyway and provides an important stopover point for fall and spring migrations. The Pacific Flyway is a complex system of branching routes, concentration or funneling points and interchanges between sub-flyways. One of the nation's largest waterfowl concentration areas is the Tululake-Lower Klamath Basin. This area acts as a funneling point for waterfowl from Oregon, Washington, Idaho, Montana and Utah. Ducks and geese that breed and nest as far away as Canada, Alaska and Siberia pass through the Tululake area. Waterfowl concentrate in this area in the fall prior to moving onto the wintering grounds in the central valley and points further south. Approximately 80 percent of the 8 to 9 million waterfowl using the Pacific Flyway pass through the Tululake-Lower Klamath area on their fall migration.

Although the great concentrations of waterfowl occur in the Tululake area, the Surprise, Goose Lake, Pit River and Big Valleys are also essential to migrating waterfowl. The attraction of these valleys to waterfowl is the agriculture-based feeding areas with adjacent lakes and reservoirs for resting and loafing.

Waterfowl are an economic and recreational benefit to the county through the attraction of the local as well as non-local hunters. The economic benefit is realized through restaurants, motels, gas stations, sporting goods stores, gun clubs, guides, etc. Waterfowl, especially in great numbers, also have aesthetic value to bird watchers and nature lovers. People are attracted to Modoc County just to view waterfowl and thus they also provide to the local economy. The Canada Goose, which nests within the county, is a major attraction to both hunter and non-hunter.

The conflicts associated with waterfowl have to this point been relatively light, being mainly associated with depredations to emerging grain crops during spring months. Crop depredations can best be prevented by hunting, where feasible, during the open season. Otherwise, herding permits are available through the U.S. Fish and Wildlife Service.



Waterfowl values in the county can be preserved by the preservation of suitable wetlands and the agricultural use of private lands.

Waterfowl values can be enhanced by proper development of wetlands and/or the expanded production of cereal crops on existing agricultural land. New reservoirs can be constructed in a manner favorable to waterfowl by making provisions for a minimum pool and avoiding steep sloping sides which are not favorable to emergent vegetation. Reservoirs without a minimum pool or escape cover can become death traps for unflighted young birds or molting adults.

OTHER WILDLIFE

Modoc County is favored by a wide variety and abundance of wildlife species not classified as game or endangered species. These species include the raptors, wading and shore birds, small mammals, and land-associated non-game birds.

The raptors which include hawks, owls, eagles, ospreys and vultures, exist in numbers proportional to the suitable habitat. The habitat requirements for these birds are as varied as the birds themselves. Some of the species are found in plentiful numbers; others are present in limited numbers. Populations of some species will vary markedly with the season of year. The value of raptors is aesthetic and as a regulatory factor on rodent populations. Problems associated with maintaining raptor populations are mainly related to indiscriminate shooting, habitat changes. Raptor populations can be protected or enhanced by: recognition of habitat needs, providing protection, and increased public awareness.

There are two species of small mammals which have economic impact on the county. Depredations occur on agricultural land by ground squirrels in localized areas of the county. Eruption of mouse populations occur in the Tulake Basin. These problems are associated with the types of agricultural land use and will persist. Control measures are carried out through the County Agriculture Commissioner's office.

Each year a large variety of shore birds, wading birds and non-game birds travel through the county on annual migrations. Many of these species breed and nest within the county; some are year around residents. The principal value is aesthetic use. Maintaining the varied habitat in a suitable condition is the key to the continued use by the variety of bird life.

One of the most significant species of birds is the sand hill crane. The nesting range of the sand hill crane in California is limited to the northeastern corner of the state. Although cranes are associated with wetland habitat, they range into agricultural land and grass land as well. Due to the great size, loud call and interesting behavior, the aesthetic value is high.

RARE AND ENDANGERED SPECIES

The Bald Eagle, while classified as endangered, is a common visitor to Modoc County during winter months. There is one known nesting site within the county. This nest produced one young in 1972. The nest is again active in 1973. There are probably other nesting sites within the county, however they remain unknown at this writing.

OREGON



NEVADA



WATER FOWL

-  Water Fowl Habitat
-  Nesting & Brooding Habitat

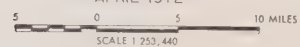


LOCATION MAP

Data from California Department of Fish & Game

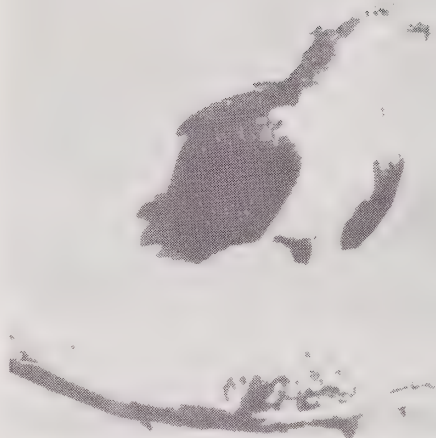
WATER FOWL
MODOC COUNTY
CALIFORNIA

APRIL 1972



The only other known endangered species of wildlife to inhabit Modoc County is the Peregrin Falcon. This bird is seen only on rare occasions and there are no known nesting sites in the county.

Although not classified as rare or endangered by the state, ospreys, golden eagles and prairie falcons have suffered much the same fate as the bald eagle and peregrine falcon. There is one known osprey nest and one known golden eagle nest in the county at this time. Each of these nests produced one young in 1972. There are no known prairie falcon nests within the county. The same protective measures taken for bald eagles and peregrine falcons should also be applied to these other species. Osprey nesting habitat can be improved by the construction of nesting platforms near mountain lakes containing a suitable fish population.



WILDLIFE REFUGES

Modoc National Wildlife Refuge

Modoc National Wildlife Refuge, containing 6,529 acres, was established in 1960 for the protection and management of migratory waterfowl and other wildlife.

Large concentrations of waterfowl occur during spring and fall. The greatest number of birds are present in the fall, when large populations of Canada geese and ducks are common. Mallards, cinnamon teal, widgeon and pintails are the most conspicuous ducks at such times. Gadwalls, lesser scaups, goldeneyes and others are also found then. Whistling swans stop on the refuge during their migrations, when numbers may reach as high as 700. Sand hill cranes also occur and a few of these spectacular birds nest on the refuge. White pelicans may be seen throughout the summer, but they do not nest. The construction of more ponds and nesting islands is encouraging larger numbers of waterfowl to nest on this historic breeding ground.

The refuge bird list contains more than 100 species. This list is being added to as new species are discovered. Some of the more common birds, other than waterfowl, are eared grebe, common snipe, willet, avocet and Wilson's Phalarope.

Mule deer and pronghorn (antelope) are present. Other mammals include the coyote, bobcat, badger, skunk, raccoon, mink, muskrat, ground squirrel, cottontail and blacktail jackrabbit.

Modoc National Wildlife Refuge was formerly operated as a cattle ranch with a small amount of grain being grown. Grazing and haying practices are continued, providing waterfowl management tools to maintain the meadows in a productive condition. Share-cropping of barley is being expanded to provide food for ducks and geese.

The refuge affords many recreational opportunities, including waterfowl hunting in season, fishing, bird watching, nature study, boating, swimming, picnicking and ice skating. Overnight camping is not permitted.

Clear Lake National Wildlife Refuge

This 33,400 acre refuge was established in 1911 and consists of an open, wind swept lake surrounded by sagebrush covered plains. 10,600 acres are open to waterfowl hunting.

Hunting pressure is generally light, with 295 hunting visits reported in 1971 and 163 in 1972. Due to the expanse of open water, duck hunting is generally poor and the above figures represent primarily Canada goose hunters.

Bird populations and production vary considerably from year to year. In 1971 the Bureau of Sport Fisheries and Wildlife estimated that the peak number of geese on the refuge was 1,114. An estimated 620 young geese were produced in 1971. In 1972, the peak number of geese was 3,735 and the production was 570. There were 17,280 ducks in 1971, with a production of 690. In 1972 there were 6,440 ducks with a production of 618.

Antelope hunting is allowed on 7,679 acres of the refuge during the state's special permit season. In recent years a quota of about ten harvestable bucks has been established and only five hunters have been allowed on the area at one time. Success has ranged between 90 to 100 percent.

Clear Lake Refuge contains one of the principal nesting colonies of white pelicans in the United States and provides important watering areas and range for the oldest historical herd of pronghorn antelope in California. Sage grouse utilize the refuge and contiguous areas. Two threatened fish species, the Lost River sucker and the short-nosed sucker, occur in the lake.

The relative isolation and inaccessability of Clear Lake Refuge helps make for a memorable experience for those who visit it, whether they be hunter, bird watcher or just outdoor enthusiast.

Tulelake National Wildlife Refuge

Tule Lake Refuge, established in 1928, is famous as the site of the largest annual concentration of waterfowl on the North American continent. This refuge of more than 37,300 acres is set in the midst of rich grainlands that were once the bed of 100,000 acre Tule Lake. The 13,000 acre lake of today, filled with aquatic food plants, and the surrounding fertile grainfields, provide ideal habitat for migrant waterfowl. Approximately 7,080 acres of this refuge are in Modoc County.

1972 population estimates by the B.S.F. & W. showed a peak of 840,750 geese and 1,039,720 ducks using the refuge. The estimated production was 845 geese and 10,364 ducks.

Hunting pressure on Tule Lake may vary greatly from year to year. In 1972 there were 25,344 visits and 115,600 activity hours of recreation attributed to hunting. Hunting success for 1972 was .56 geese/hunter and .69 ducks/hunter. A total of 11,453 geese and 14,111 ducks were taken during the season. The above figures do not reflect crippling losses. A total of 2,872 pheasants were bagged by 4,867 hunters for a success figure of .59.

Non-consumptive recreational uses continue to increase from year to year. In 1972, nearly 26,400 wildlife observation and wildlife-wildlands related visits were recorded.

State Game Refuges

The California State Legislature has established two game refuges in Modoc County for the protection of wildlife. The Warner Refuge was established in 1917 and contains approximately 32,000 acres. This refuge is located on the west slope of the Warner Mountains and includes a portion of the Warner Wilderness Area. The Long Bell Refuge was established in 1927 and contains about 33,920 acres. This refuge is 25 miles west of Canby and is partially in Siskiyou County.

Deer are the principal game animals using these refuges, but all other wildlife is protected as well. The only special management on these areas is patrolling to enforce the no hunting regulation.

The location of State and Federal Wildlife Refuges is shown on the Recreation map following page R-10.

DISCUSSION

County-Wide Issues

1. There is a general indifference to the needs for the improved management of all forms of wildlife and its habitat.
2. Physical construction and the activities of man have a serious effect on wildlife. This effect may be minor when separate, isolated actions are considered, but continued activities in the same area may reduce or render useless key habitat areas. Where migration routes are blocked, destination areas of valuable habitat may be made unusable.
3. Although the land in Modoc County is largely in public ownership, some of the most valuable habitat areas are privately owned.

Recommendations

1. It is recommended that the county endeavor to educate and increase the awareness of the public to the needs for the preservation, management and enhancement of all wildlife and habitat.
2. It is recommended that the procedure for the approval of subdivisions carefully consider wildlife values before approval is granted.
3. It is recommended that ranching and farming interests be encouraged to develop and maintain wildlife habitat.
4. It is recommended that the county adopt a policy of conservation for rare and endangered species and for the protection and enhancement of their habitat.

Fisheries

MODOC COUNTY'S LAKES AND STREAMS
CAN PROVIDE A CHALLENGE AND REWARD
TO BOTH THE EXPERIENCED ANGLER AND
THE NOVICE.

FISHERIES IN MODOC COUNTY

Many hunters camp near fishing areas a week or more before the deer season opens and spend their time angling. Lakes in the South Warner Wilderness may be reached only by horse or foot travel. Major fishing streams and the species found in them are listed in Table 13.

Most of the several hundred miles of fishing streams and several thousand acres of lakes and reservoirs are accessible to fishermen.

Major lakes that support significant fisheries are shown on the recreation map, following page R10. The map is keyed to Table 14 for identification and species of fish.

COLDWATER FISH

Rainbow trout, to a lesser extent, and cutthroat trout, were native to many streams of Modoc County. Brook trout (from northeast North America) and brown trout (from Europe) have been widely planted, sometimes to the detriment of the native species.

Rainbow Trout - *Salmo gairdnerii*

This is the common trout of California. Rainbow trout normally spawn in spring. Lake populations enter suitable tributary streams and travel to spawning sites. Stream populations usually spawn in suitable areas of their home stream. The California Department of Fish and Game supplements natural production in streams, and stocks many lakes without spawning areas, with fingerlings and "catchable" trout produced in the state fish hatcheries.

Cutthroat Trout - *Salmo clarkii*

Cutthroat trout are another western species native to California. This species hybridizes with rainbow trout. It does not compete well with the rainbow. Like the rainbow, the cutthroat spawns in spring, and uses the same types of spawning sites. Although the Department of Fish and Game plants cutthroat fingerlings, the number produced is much smaller than the number of rainbows.

Eastern Brook Trout - *Salvelinus fontinalis*

The brook trout has proven to be best adapted to the colder waters of high lakes and the highest altitude portions of mountain streams. Brook trout spawn in streams, where available, but they also use springs and other suitable areas in ponds or lakes. Unlike the native rainbow and cutthroat, brook trout spawn in the fall.



Brown Trout - *Salmo trutta*

Anglers find the brown trout the most difficult species to catch. Because most strains are both extremely wary and excellent predators, browns tend to live longer and grow larger than most rainbows, cutthroats, and brooks in the same waters. The brown trout is native to Europe. California browns are a mixture of strains derived from Scotland and Germany. Like the eastern brook trout, browns are fall spawners. Preferred spawning habitat is in stream gravels.

WARMWATER FISH

As almost everywhere in California, the warmwater sport fishery depends primarily on species derived from eastern and southeastern North America.

Brown Bullhead - *Ictalurus nebulosus*

The brown bullhead is found in several impoundments on the Modoc and in the Pit River. This catfish attracts many local fishermen and provides both sport and a food source.

The bullhead uses the deeper waters of lakes and slow moving rivers. Spawning takes place in shallow muddy areas in the vicinity of protective underwater cover.



Channel Catfish - *Ictalurus punctatus*

The channel catfish has been successfully stocked in the Pit River. This omnivorous species prefers streams with clear water and sand, gravel or rubble bottoms. It does, however, do well in turbid waters, and in lakes. Spawning occurs between late May and mid-July and requires water temperatures between 70° and 85°F. This fish reaches weights of over fifty pounds in its native range and has a high potential as a trophy fish as well as a food source.

Largemouth Bass - *Micropterus salmoides*

Largemouth bass are a favorite sportfish of eastern North America. This species prefers warm waters, about 80°F. At temperatures below 50° they become inactive and remain in deep water. They are spring spawners, in shallow water, at temperatures over 65°F.

Largemouth bass prefer nonflowing waters which have both aquatic vegetation and "clear-water" areas. In California they have done well in some impoundments which lack rooted aquatic plants. Populations are being successfully maintained in fluctuating reservoirs and in streams.

Although largemouth bass fishing requires patience, knowledge and skill, the large size, fighting characteristics, and good eating qualities of this species makes it a desirable gamefish in suitable waters.

TABLE 13 - MODOC COUNTY FISHING STREAMS

Stream	Location	Rainbow	E. Brook	Brown	Brown Bullheads	Channel Catfish	Bass	Bluegill	Crappie
Ash Creek	East of Adin	X		X	X				
Bidwell Creek	East Side of Warners	X	X	X					
Boles	South of Clear Lake	X							
Canyon Creek	Southwest of Alturas	X		X					
Cedar Creek	East Side of Warners	X							
Cottonwood Creek	East Side of Warners	X	X						
Davis Creek	West Side of Warners	X	X	X					
Deep Creek	East Side of Warners	X							
Dismal Creek	East Side of Warners	X							
Eagle Creek	East Side of Warners	X							
East Creek	West Side of Warners	X	X	X					
Emerson Creek	East Side of Warners	X	X						
Fitzhugh Creek	West Side of Warners			X					
Fletcher Creek	Devil's Garden		X						
Jim Creek	West Side of Warners	X							
Johnson Creek	North of Adin	X							
Joseph Creek	West Side of Warners	X	X						
Lake City Canyon	East Side of Warners	X	X						
Lassen Creek	West Side of Warners	X							
Lost River	Northeast of Newell				X				X
Mill Creek	West Side of Warners	X	X	X					
Mill Creek	East Side of Warners	X	X	X					
New Pine Creek	West Side of Warners	X		X					
North Fork Pit River	West Side of Warners			X		X			
Owl Creek	East Side of Warners	X							
Parker Creek	West Side of Warners	X							
Pine Creek	West Side of Warners	X	X	X					
Pit River	West Side of Warners			X		X			
Rush Creek	North of Adin	X	X	X					
Shields Creek	West Side of Warners	X							
South Fork Pit River	West Side of Warners	X		X					
Stone Cole Valley	Southwest of Canby				X	X	X		
Thoms Creek	West Side of Warners			X					
Toms Creek	Southeast of Canby	X							
Twelve Mile Creek	East Side of Warners	X	X						
Willow Creek	West Side of Warners	X	X						
Willow Creek	Northwest of Alturas	X							

Other Species

Two small sportfishes, Blue gills - *Lepomis macrochirus* - and the closely related Green sunfish - *Lepomis cyanellus* - are listed with the forage fishes. The green sunfish is seldom considered a "sportfish" - usually not even a forage fish; generally a rough fish.

TABLE 14 - FISHING LAKES & RESERVOIRS

Lake or Reservoir	Number on Recreation Map	Surface Area	Rainbow	Eastern Brook	Browns	Brown Bullheads	Bass	Catfish
Big Sage Reservoir	1	5,270	X	X				
Bishop Reservoir	2	30	X	X				
Briles Reservoir	3	20	X	X				
Cave Lake	4	3.2		X				
Clear Lake	5	48	X	X	X			
Dorris Reservoir	6	802					X	X
Egg Lake	7	1,350				X		
Fee Reservoir	8	493	X					
Lake Annie	9	20	X		X			
Lily Lake	4	6	X					
Mosquito Lake	10	160				X		
West Valley Reservoir	11	970	X					X

THE FORAGE AND "ROUGH" FISHES

Habitat management planning for gamefish must include consideration of their food organisms and their competitors. The distribution of "rough fish" species is frequently added to by illegal use and release of bait fishes by some fishermen in violation of the law.

Tui Chub

The tui chub inhabits lakes and deep quiet waters of larger streams. They do particularly well in highly alkaline lakes. Slow growers, the chubs in Big Sage Reservoir are four inches long at two years and only eight inches long at six years. They are omnivorous, compete for food with trout and bass, and have a high reproductive rate which permits them to rapidly overpopulate many lakes. The slow growth rate permits largemouth bass and large trout to use chub for forage until they are about two years old.

Tui chubs may reach sixteen inches, and are sometimes taken in sport fishing. The bony flesh is reported to have excellent flavor.

Speckled Dace - *Rhinichtys osculus*

Speckled dace are small fish found of riffles in small streams and along the shoreside shallows of lakes where there is a rock or gravel bottom. Dace probably compete with trout fingerlings for food, but provide a good forage source for large trout.

Bluegill - *Lepomis macrochris*

This sportfish is frequently introduced as a forage and alternate sportfish in stocking largemouth bass. The bluegill-bass balance in a pond is critical, with bluegill frequently overpopulating waters and outcompeting the juvenile bass.

Green Sunfish - *Lepomis cyanellus*

This small fish superficially resembles the bluegill and often serves as a forage fish although it tends to overpopulate and stunt, partly because it is seldom sought as a sport species. Closely related to the bluegill, it is often found in the same waters. Because it is usually less than seven inches in length (frequently much less) it provides a suitable forage fish for larger species.

Suckers - *Catostomus* spp.

The Modoc Sucker - *C. microps* - is found in the Pit River drainage. The Goose Lake Western Sucker - *C. occidentalis lacusansepinus*, of the isolated Goose Lake Basin, is a subspecies of the western sucker which is found in many California streams including the Sacramento drainage.

Suckers are slow-growing, omnivorous, bottom-dwellers, using both streams and lakes. They are fairly large fish, reaching lengths of at least twenty-four inches and weights of over five pounds. Juvenile suckers are forage fish for game species.

Squawfish or "Sacramento Pike" - *Ptychocheilus grandis*

The widespread squawfish mingles the characteristics of forage and gamefishes. Because they grow slowly, seldom exceeding three inches in their first year, they provide some forage for predatory gamefish. However the squawfish is itself a voracious predator, competes for food with trout, and preys heavily upon small trout and trout eggs.

Squawfish prefer the warmer waters of trout habitat and are frequently caught by anglers who use flies, bait or artificial lures while fishing for trout. Since they may reach thirty-six inches in length and weight of over five pounds, they make a fairly impressive catch in some waters. Despite an undeserved low culinary reputation they are an excellent food fish.

RARE AND ENDANGERED SPECIES

Distribution of the Modoc Sucker includes: Rush Creek, Willow Creek, Boles Creek, Ash Creek and Dorris Reservoir. Studies are underway to seek the distribution, habitat requirements and techniques for preservation and maintenance of the Lost River Sucker and the Shortnose Sucker as well as the Modoc Sucker. All three of these species are considered to be endangered species.

DISCUSSION

County-Wide Issues

1. Over-fishing is a potential source of damage to a fishery. It is controlled by catch and possession regulations designed and administered by the state. Where over-fishing does occur, it is often only a temporary setback to a fishery because the reduction of catchable sportfish leads to a reduction in angling success. The waters affected attract fewer fishermen and the resulting "rest" may lead to recovery of the sportfish population. Where rapid recovery of a fishery is desired, or when selective angling has caused a sportfish population to be replaced by less desirable fish, various combinations of stocking and eradication programs are used by the Department of Fish and Game to restore the fishery.
2. Construction activities, such as road building, channel clearance projects, gravel removal, etc. may cause sediments in quantities sufficient to severely damage or destroy fish habitat. Where channel straightening is done, habitat may be physically destroyed. Increased water velocities through straightened sections may damage the channel both above and below the construction work. These activities may lead to the destruction of food, cover and spawning areas.
3. The construction and operation of water storage dams can damage the fishery resource by raising water temperatures in the stream below or by completely drying up the stream. Reservoirs do provide much of Modoc County's better fishing, but stream fishing is important also.

Recommendations

1. Road building agencies and construction contractors should be required to avoid moving equipment in streambeds, using streams as dumps for waste earth and gravel, and designing roads which require straightening, canalization, transposition or other alteration of streams. Road maintenance activities should come under similar control.
2. Where a dam is imposed on a fish-producing stream it is important that provision be made for sufficient release of water to permit at least minimum habitat conditions needed for maintenance of fish below the dam.
3. There is a need to identify valuable fisheries on private lands and to promote the improvement and use of these areas.
4. Unauthorized introduction of "alien" fish has changed many fishery habitat conditions in Modoc County which has led to loss of a more valuable fish already existing (i.e. catfish). This should be controlled by cooperation between agencies and the landowner.

Minerals

NATURE DID NOT ENDOW MODOC COUNTY WITH
TREMENDOUS MINERAL WEALTH. EARLY DAY
MINING BOOMS SOON FADED AND CURRENT
PRODUCTION IS CENTERED ON CONSTRUCTION
MATERIALS.

MINERALS

Data for this section was extracted from "Geology of Northern California", California Division of Mines and Geology Bulletin No.190, 1966.

The minerals industry of this county is dominated by three factors: (1) a narrow range in variety of rocks which are primarily cenozoic basalt and andesite, with local lake-laid sedimentary rocks; (2) a low population density, creating but minor market demand, and (3) the lack of known commercial deposits of any mineral commodities except pumice, volcanic cinders and peat suitable for mining and shipping to more distant population centers.

The principal mineral commodities of the county, all of which are directly related to its volcanic terrain, are volcanic cinders, pumice and pumicite, and crushed stone used for railroad ballast, lightweight aggregate and regular aggregate respectively. Volcanic products of potential importance are tuffaceous stone, for dimension stone; perlite for light weight aggregate, and obsidian, sought by rock collectors for decorative purposes.

Metallic commodities are notably lacking in the county, although two minor gold districts and minor showings of quicksilver are known.

Lakebed deposits include peat that is being utilized, diatomite as yet unused and salt which has not been recovered for many years. Stream and flood-plain deposits of sand and gravel are used locally for aggregate, but their chemical reactivity owing to excessive glass creates a problem. Mainly of historical interest are minor showings of low-grade coal; local common clay deposits formerly used for brick; spring-deposited limestone once burned for local use as mortar; and various siliceous materials, such as jasper and petrified wood, sought by rock collectors.

METALLIC MINERAL COMMODITIES

Gold

At High Grade, in the northern Warner Range, rich but discontinuous oreshoots were found within a hundred feet of the surface. Gold occurred mainly in narrow stringers in quartz filled, steeply dipping silicified breccia zones and veins in Tertiary rhyolite. Despite enthusiastic promotion of the camp in 1909-1911, its productivity was about \$75,000 from 1910 to 1919, and perhaps \$10,000 from 1931 to 1934. Since 1934 it has been essentially inactive.

The Winters District, near Adin Summit, comprises only the lost Cabin mine, which in the early 1900's yielded about \$10,000 from oxidized gold-bearing ore occurring in sheared calcite- and quartz-filled brecciated zones in Tertiary andesite.



Mercury

At several localities along the east side of Goose Lake, Modoc County, traces of cinnabar occur with chalcedonic silica as vein and seam fillings in brecciated, iron-stained, Tertiary rhyolite and interbedded tuff. Despite furnaces (now ruins) built in the 1940's and earlier at three localities, and local reports of "several flasks" of quicksilver produced from small rich pockets reached by shallow workings, no production is recorded. Exploration, though sporadic in recent years, was underway in mid-1965.

NONMETALLIC MINERAL COMMODITIES

Calcite (optional)

On the lower east slopes of the Warner Range, Modoc County, calcite pods and veins as much as two feet thick yield clear optical-grade calcite, suitable for making polarizing prisms and other precision optical equipment. The calcite occurs in Miocene andesitic tuff-breccia of the Cedarville Series in two localities, just west of Cedarville, and two miles north of Eagleville. About 1,000 ounces of optical calcite from the more southerly location were sold in 1920 and 1921. This shipment included usable crystals as large as twelve inches. An additional undetermined quantity was recovered from this deposit during World War II for use in gunsights. In the late 1940's about 1,000 pounds of chemically pure calcite from the same deposit were sold as a standardizing agent for testing acids, but no subsequent production is known.

Decorative stone

Various decorative limy spring deposits and siliceous rocks such as jasper, chalcedony, and petrified wood, are hunted by mineral collectors ("rockhounds") in the region. Obsidian also is sought, but it is discussed separately in this article as it has another use. Favorite collecting localities are in the eastern desertlike areas, especially near hot springs, in the Warner Range, and all parts of the terrain underlain by the Tuscan Formation.

Obsidian

Quaternary obsidian masses in the Medicine Lake Highland and in the Warner Range are sites of avid mineral-collector activity. Chatoyant ("rainbow") obsidian and red-streaked obsidian from the Warner Range are especially prized for cutting and polishing. Apparently, several thousand dollars worth of obsidian from the Warner Range was sold in the 1960's, and a large number of claims were staked covering desirable deposits. An unusual development came in the early 1950's, when several large pieces of clear obsidian from Glass Mountain, Siskiyou County, were cut and polished to make experimental industrial mirrors.

Peat

Recent accumulations of hypnum peat moss in the Pleistocene lake basin of Jess Valley, Modoc County, are the only source of peat moss in California. The usable peat layer is about 300 acres in area and about 3½ feet thick, lying beneath a foot of overburden. The deposit, which has been mined since 1939, yields in excess of 10,000 tons of peat moss a year. After the overburden is stripped, the peat is piled to dry for two months, then screened, shredded, and bagged in 80 pound bales at Likely for truck and rail shipment. The peat moss is used throughout California and seven western states for soil conditioner.

Perlite

Two deposits of perlite near Sugar Hill were prospected and tested for lightweight aggregate in the late 1940's but no production has resulted. These deposits are perlitic phases of Tertiary rhyolitic intrusions and flows. The first perlite to be tested for commercial expansibility in California was several hundred tons from Sugar

Hill, shipped to Campbell, Santa Clara County, for the test in 1947. The availability of good quality perlite in large, uniform deposits much closer to the main centers of use, is mainly responsible for the lack of utilization of these more remote deposits.

Pumice and pumicite

About 30,000 tons of pumice and pumicite (about one-third of California's annual production) are mined each year in this region, with almost all coming from deposits at Glass Mountain, eastern Siskiyou County. The quarrying of pumice and pumicite (particles of pumice smaller than 4 mm) began in this region in the mid 1940's and through 1965 totaled about 500,000 tons. The deposits of the Glass Mountain area consist of loosely consolidated grayish-white rhyolite pumice tuff breccia of Recent age. The tuff breccia occurs in a blanket that ranges in thickness from one to sixty feet, and extends over about ten square miles northeast of Medicine Lake Highland, eastern Siskiyou and western Modoc Counties.

After the overgrowth and thin soil overburden is removed, the pumice is quarried in broad pits by scraper loaders, and trucked about ten miles to Tionesta for screening and rail shipment, or to pumice block plants near Perez, Modoc County. About 75 percent of the pumice is made into blocks in the area, for shipment throughout northern California and Oregon; about 25 percent is shipped in bulk to the San Francisco area, where it also is used to make lightweight building block. Sized pumice costs about \$2.20 per short ton at the railhead.

Several hundred tons of pumice scouring blocks are sawed each year from a pumiceous obsidian crust atop Glass Mountain.

Salt

Brine pumped by windmills from shallow wells and ponds in unconsolidated Recent lake sediments east of Middle Surprise Lake once yielded a small tonnage of crude salt by solar evaporation. The salt was used locally for stock feed in the early 1900's. The salt works has been inactive since 1925 and is almost obliterated.

Sand and gravel

Most towns throughout the region have local sources of sand and gravel used in small noncommercial quantities for portland cement concrete and asphalt concrete aggregate. Owing to its high content of glassy volcanic rocks, much of the sand and gravel in the region is too reactive for high-specification portland cement concrete, although it is commonly used for less exacting purposes in local road construction. Highway building contracts commonly specify crushed stone, or require sand and gravel hauled from deposits outside this region, especially for curbs, gutters and bridges.

The principal sources of sand and gravel are local stream alluvium in various localities; deltaic lake terrace deposits in Goose Lake and Surprise Valley and Quaternary flood-plain gravels near Alturas.

Stone, crushed

Like sand and gravel, and volcanic cinders, crushed stone is produced and used throughout the region in undetermined tonnages, with almost all being used for asphalt concrete aggregate and road building material. Various Tertiary and Quaternary basalt and andesite flows are sources of high-specification crushed stone throughout the region; notable quarries are at Canby Bridge and Likely.

Stone, dimension

In the 1800's and early 1900's small tonnages of Tertiary tuffs and tuff breccias near Alturas were quarried for local use in a few public and commercial buildings. This quarry has been inactive for several decades.

Volcanic cinders

Cinder cones at about 20 localities in northeastern Shasta County, eastern Siskiyou County, and western Modoc County have been sources of about five million tons of volcanic cinders since large-scale quarrying began in this area in the early 1930's. Production from the region has been about 140,000 tons of volcanic cinders each year for the past decade - about two-thirds to three-fourths of California's annual production.

The cinders at most cones are red, gray or black basaltic to andesite scoria fragments. The cinders are layered as they originally fell and are accompanied by scattered volcanic bombs. Most of the cones that have yielded cinders are Pleistocene, but a few are Recent.

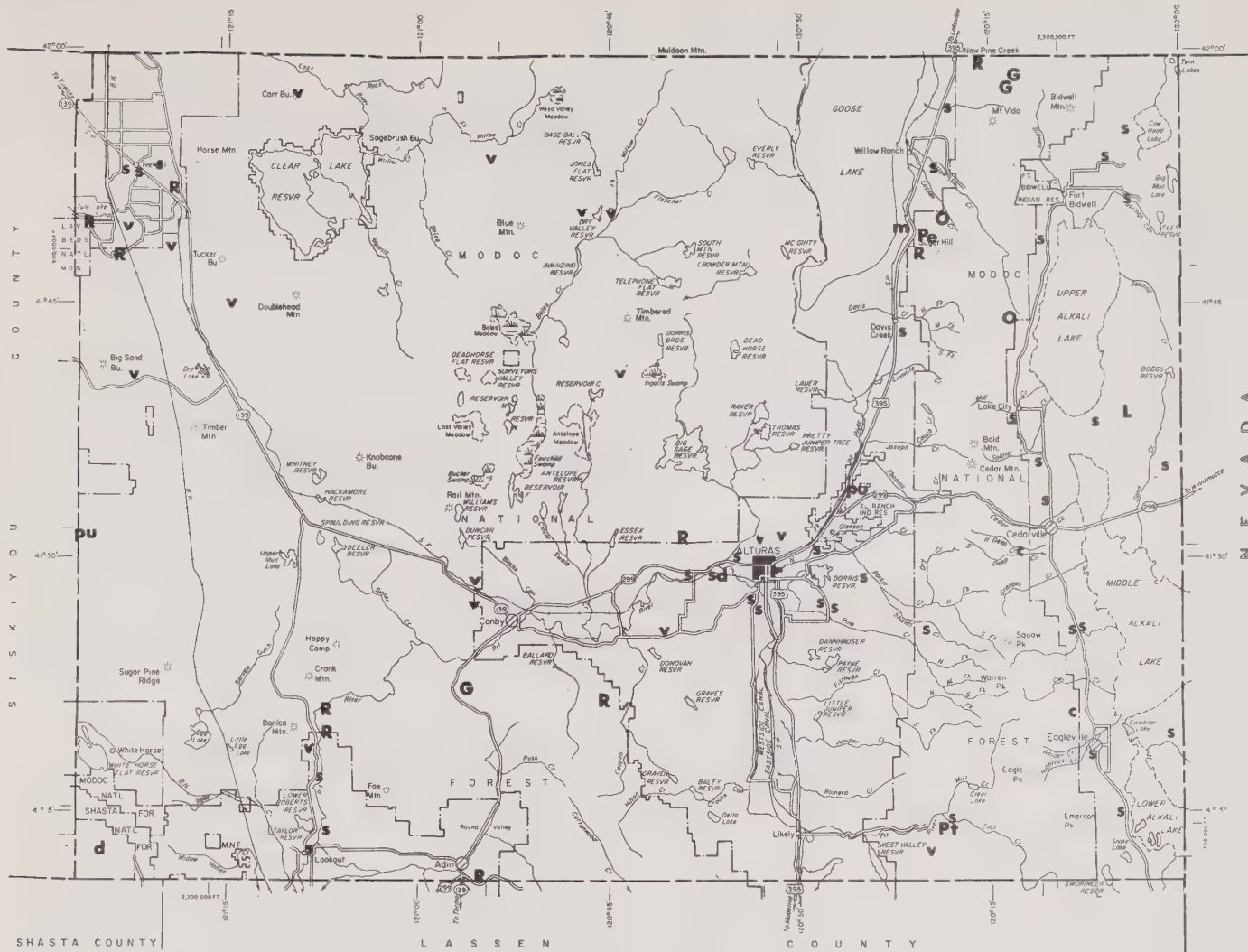
The main tonnage of volcanic cinders from this region has been used for railroad ballast, although it has been decreasing in the past decade; a lesser but growing tonnage, from cones throughout the region, is used as road material - fill, asphaltic concrete aggregate and surfacing material. Smaller tonnages, but also notably increasing over the past decade, are used as lightweight aggregate in building blocks.

See the Minerals map, following page, for the location of known mineral deposits in Modoc County.

DISCUSSION

The mining industry in Modoc County is not extensive at the present time and the inventory of known minerals indicates that we can expect little expansion. Known mineral deposits should be protected from conversion to other uses by guiding construction activities to other sites wherever possible. Open pit and quarry operators should be encouraged to shape and revegetate their abandoned sites.

OREGON



MINERALS

- c** - Optical Calcite
- d** - Diatomaceous Earth
- G** - Gold
- L** - Limestone
- m** - Mercury
- O** - Obsidian
- Pe** - Perlite
- Pu** - Pumice, Pumicite
- Pt** - Peat
- R** - Rock, Crushed
- s** - Sand & Gravel
- sd** - Stone, Dimension
- v** - Volcanic Cinders

MINERALS MODOC COUNTY CALIFORNIA

APRIL 1972

SCALE 1:253,440

Uses of the Land

Agriculture

Forestry

Tourism

USES OF THE LAND

The land area of Modoc County is approximately 2.6 million acres. Of this, about 35% is private, county or state owned, while the remaining 65% is administered by various federal agencies.

The major land-using industries are Agriculture, Lumbering and Recreation-Tourism.

PRIVATELY OWNED LANDS

Agriculture is the primary use of more than 70% of the privately owned land. Lumbering, recreational subdivisions and urban areas are the primary uses of most of the remainder. The Recreation-Tourism industry is a secondary user of part of the agricultural and timbered land.

The use of the privately owned lands results in the major portion of the county's agricultural income because they not only produce crops for sale but they provide a base for the livestock which use the public lands.

PUBLIC LANDS

The public lands are an important source of summer feed for the livestock industry in Modoc County with some 23,000 head of cattle for a three to six month period and nearly 18,000 sheep are grazing for one to four months. This feed produces about 12% of the meat sold from Modoc County ranches and has a current annual value of nearly two million dollars. One of the primary values of the federal ranges is that they help make a ranch a year around operation by providing a place to go with livestock of a time when it is necessary to allow irrigated lands to produce hay for winter feeding.

Stockmen pay grazing fees totaling about \$98,000 for the privilege of using these lands. Timber producers pay about \$5,242,000 for the privilege of harvesting 71,500 thousand board feet of timber with a wholesale value of an estimated \$14,308,000. Recreational users pay about \$8,800 for an estimated 703,000 recreation use days with a value of about \$703,000.

The county assessor is obligated by state law to collect a "possessory interest" tax on all federal land, grazing permits and timber sales. This tax is based on state mandated formulas and adds significantly to the cost the rancher and lumberman pays for his use of federal lands.

The county receives about 25% of the grazing and timber fees collected by the Forest Service and Bureau of Land Management. These funds must be used for schools and the improvement of the road system.

Table 15 summarizes the uses made of the federal lands and the fees collected for those uses.

TABLE 15 - USE OF PUBLIC LANDS
IN
MODOC COUNTY

	Modoc National Forest ^{1/} (thousands)	National Resources Lands ^{2/} (thousands)	Total (thousands)
Livestock			
Cattle	18	5	23
Sheep	17	1	18
Fees Paid	\$ 79	\$ 19	\$ 98
Value Produced ^{3/}	\$1,557	\$367	\$ 1,924
Timber			
Board Feet	71,442	101	71,543
Fees Paid	\$ 5,236	\$ 6	\$ 5,242
Value Produced ^{4/}	\$14,288	\$ 20	\$14,308
Recreation Use			
Visitor Days (estimated)	552	151	703
Fees Paid	\$ 9	-0-	\$ 9
Value Produced ^{5/}	\$552	\$151	\$703
Other Uses			
Fees Paid	\$10	-0-	\$10

1/ Data from United States Forest Service, Alturas - 1973 Fiscal Year

2/ Data from Bureau of Land Management, Susanville and Redding District Offices

3/ Value assumes 175# season gain @ 40¢/lb. ave. selling price for cattle, 70# season gain @ 25¢/lb. for sheep

4/ Value assumes \$200/1000 b.f. ave. selling price

5/ Value assumes \$1.00/visitor day ave. value of recreational visit

MODOC AGRICULTURE

According to the 1965 U.S. Census of Agriculture, Modoc County has 528 farms, embracing about 751 thousand acres of land. In 1969 there were 483 farms and in 1972 over 630. These farms are generally restricted to five distinct and separate areas: (1) the Tululake area, (2) Surprise Valley, (3) the Pit River Valley around Likely, Alturas and Canby, (4) the Goose Lake Valley, and (5) Big Valley. Crops, mostly hay, small grains, potatoes and onions, are harvested from 129 thousand acres each year. About 80 percent of this cropland acreage is irrigated.





The topography, climate and other factors dictate that livestock ranching





CALIFORNIA PLANE COORDINATE SYSTEM,
ZONE 1, 100,000 FT GRID

LAND USE MAP

-  Cropland (Irrigated and Non-Irrigated)
-  Woodland
-  Rangeland
-  Miscellaneous Use Recreation, Watershed, Wildlife, Ect.

Limitations indicated do not always apply to entire area shown. The severe limitation is shown if it represents over one-third of the soil association, otherwise the most extensive limitation is shown.

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

This map was developed from the General Soils Maps, on-going soil surveys, Conservation Needs Inventory and other data.



LOCATION MAP

LAND USE MAP MODOC COUNTY CALIFORNIA

ADIN-LOOKOUT, CENTRAL MODOC, GOOSE LAKE, LAVA BEDS, AND SURRIS VALLEY RESOURCE CONSERVATION DISTRICTS. PREPARED BY THE UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE FOR THE MODOC COUNTY PLANNING COMMISSION, MODOC COUNTY, CALIFORNIA.

MARCH 1973

5 0 5 10 MILES

will continue to be an important segment of the county's economy. Modoc County has a land area of approximately 2,622,000 acres of which less than 10 percent is cropland. Most of this land is the basis for the livestock production of the county. The only strong land use competitors are forestry and outdoor recreation such as hunting, camping, fishing, riding, hiking, etc. The competition for recreation will become stronger as population increases and transportation facilities make the area more accessible. Recreation will not displace livestock as the major use of this land in the foreseeable future, however.

During recent years, the value of all crop and livestock production has ranged from 36.4 million dollars. About 25 percent of this represents hay and grain utilized for local livestock production, so the net cash input of agriculture to the economy of the county varies from 27.3 million dollars annually.

Outside of the Tulelake area livestock production dominates the agricultural picture. The Tulelake area contributes about half of the agricultural income of the county, with malting and feed barley, Durum wheat, potatoes, alfalfa hay and onions being the principal cash crops.

The livestock industry of Modoc County consists of 115,000 cattle, 25,000 sheep and 2,400 pigs. Cattle are the dominant type of livestock and contribute about 95 percent of the livestock income in the county.

The beef industry of Modoc County is currently contributing about \$13 million to the county's economy, the largest single segment of the agricultural industry. During the last five years, beef production has varied from less than \$7 million to over \$13 million.



ECONOMIC SITUATION

The geographical isolation of Modoc County has not insulated it from the adverse economic forces which have affected farmers all over the nation. The number of farms in the county has declined from 823 in 1950 to just over 630 in 1972. During the same period, the average size of farms in the county has risen from 827 acres to 1554 acres in 1969. Total agricultural production has increased. This is no anomaly, since the farms which have disappeared are generally those which were inadequately financed or inefficiently managed.

The loss of rural population which accompanied the consolidation of farms has been a major factor in the overall population loss suffered by the county during the past fifteen years. This, of course, has had its effect on retail business; large farms may produce higher yields, but they provide fewer customers for local trade.

Personal income of Modoc County residents is nearly \$25 million. Agriculture

contributes nearly \$17 million of this income. Manufacturing adds about \$1.3 million and minerals \$.5 million. The remaining \$6.2 million is largely tourist trade and other services.

TABLE 16 - PERSONAL INCOME IN MODOC COUNTY 1969

	<u>Million Dollars</u>
Wages	\$11.0
Other labor income	.4
Proprietors	7.0
Property income	3.1
Transfer payments	3.1
Total	<u>\$24.7</u>
Agricultural sales	\$16.9
Value added in manufacturing	1.3
Minerals	.5
Other	6.2
Total	<u>\$24.7</u>

DISCUSSION - A LOOK AT THE FUTURE

Since the original Overall Economic Development Program for Modoc County was prepared in 1963, it has become increasingly apparent that the future of agriculture in Modoc County will be influenced more by nationwide and even worldwide economic forces than by any attempts at local development.

Agriculture will be in competition with two aspects of development, water consumption (previously mentioned) and land use patterns resulting from the subdivision and associated processes. Farm size has been on the increase in the past years but in much of the lands most suited for agricultural growth, land divisions for summer home and other uses have occurred. Some of these areas have quickly been converted from grazing and cropland to homesites, taking such lands from production.

Beef cattle will continue to be an important segment of the agriculture of Modoc County. Much of the land of the county can be used only by livestock. Until some more profitable use of this land is developed, it will continue to be used for livestock production, primarily cattle.

Changes which can be expected in the cattle industry will include but not be limited to the following:

- A. Small ranches will continue to go out of production and their land and cattle resources will be combined with other operations to increase the size of the remaining enterprises. The ability of the small ranches to generate sufficient income to support a family is nonexistent. An economical sized unit several years ago is now too small. The trend toward larger ranches will continue as a result of economic pressures.
- B. Ranchers will continue to adopt new technologies which will improve their calf crops, increase the rate of gain, produce more meat per unit of feed, and improve their marketing situation.

- C. Further development of irrigation and the production of high quality hay will promote higher production in the livestock industry.
- D. More good ranch management practices of breeding will shorten the calving season, limit the calving season to the time of year which best fits the feed supply of the ranch, and improve the efficiency of production marketing.

The Land Use map, following page 98 shows the general pattern of existing land use in Modoc County. It should not be confused with the map in the Land Use Element of the General Plan.

Recommendations:

1. Urban development, within established spheres of influence of cities and towns should preceed in an orderly fashion with coordinated extensions of utility services. The county should avoid fragmented urban growth extensions in order to maintain maximum usable agricultural acreages.
2. Agricultural use zones should be established to encompass the presently highly productive areas of the county. These areas should generally correspond to the present and potential soils conditions as well as present crop use areas.
3. Modoc County should attempt to maintain agriculture as a primary, extensive land use. This should not come solely from the recognition of agriculture's real contribution to the economic conservation of open space and related resources.
4. At the present time, "Agriculture Preservation" and the associated state Williamson Land Conservation Act are far from being feasible in Modoc County because of the general economic conditions it would impose. Presently, tax incentives would not materialize for preservation but would actually become a liability as tax gains on timber lands would be diminished, to leave the remainder of the tax load on croplands. It is recommended that the Williamson Land Conservation Act be carefully refined to meet local needs for agricultural croplands before implementation is considered.

FORESTRY

Forests cover almost half of the 2,619,000 acres of land in Modoc County. Of the 1,297,000 acres of forest land, 704,000 are considered as commercial forest land^{1/}. The remaining 593,000 acres of forest is principally western juniper, with some hardwoods and also lodgepole pine considered as a noncommercial species although it is currently being harvested by some companies.

The latest inventory data from the Modoc National Forest indicates that there are about 50,000 acres formerly classified as commercial forest land which is now considered as noncommercial due to poor site or isolated occurrence.

The publicly owned commercial forest lands comprise 69% of the total in Modoc County. The privately owned lands, particularly those of the Weyerhaeuser Company, are being placed under intensive forest management and will continue to play an important part in the timber economy.

The 1908 Receipts to States Act states that "twenty-five percentum of all monies received during any fiscal year from each national forest shall be paid, at the end of such year, by the Secretary of the Treasury to the state in which such national forest is situated, to be expended as the state legislature may prescribe for the benefit of the public schools and public roads of the county or counties in which such national forest is situated".

Assuming that the private forest lands are at least equal in quality to that of the public lands then the annual growth per year for all the commercial forest land in the county is approximately 106 million board feet per year. This compares favorably with the annual cut which averaged about 92 million board feet during the years 1969 to 1972^{2/}. The problem for the Modoc economy has been not so much the level of harvest, but the fact that much of the harvest is processed outside the county, which results in a loss of jobs.

The three sawmills in Modoc County finished about 44.3 million board feet during 1972, and about 98.8 million were cut. This means that more than one-half left the county to be processed.

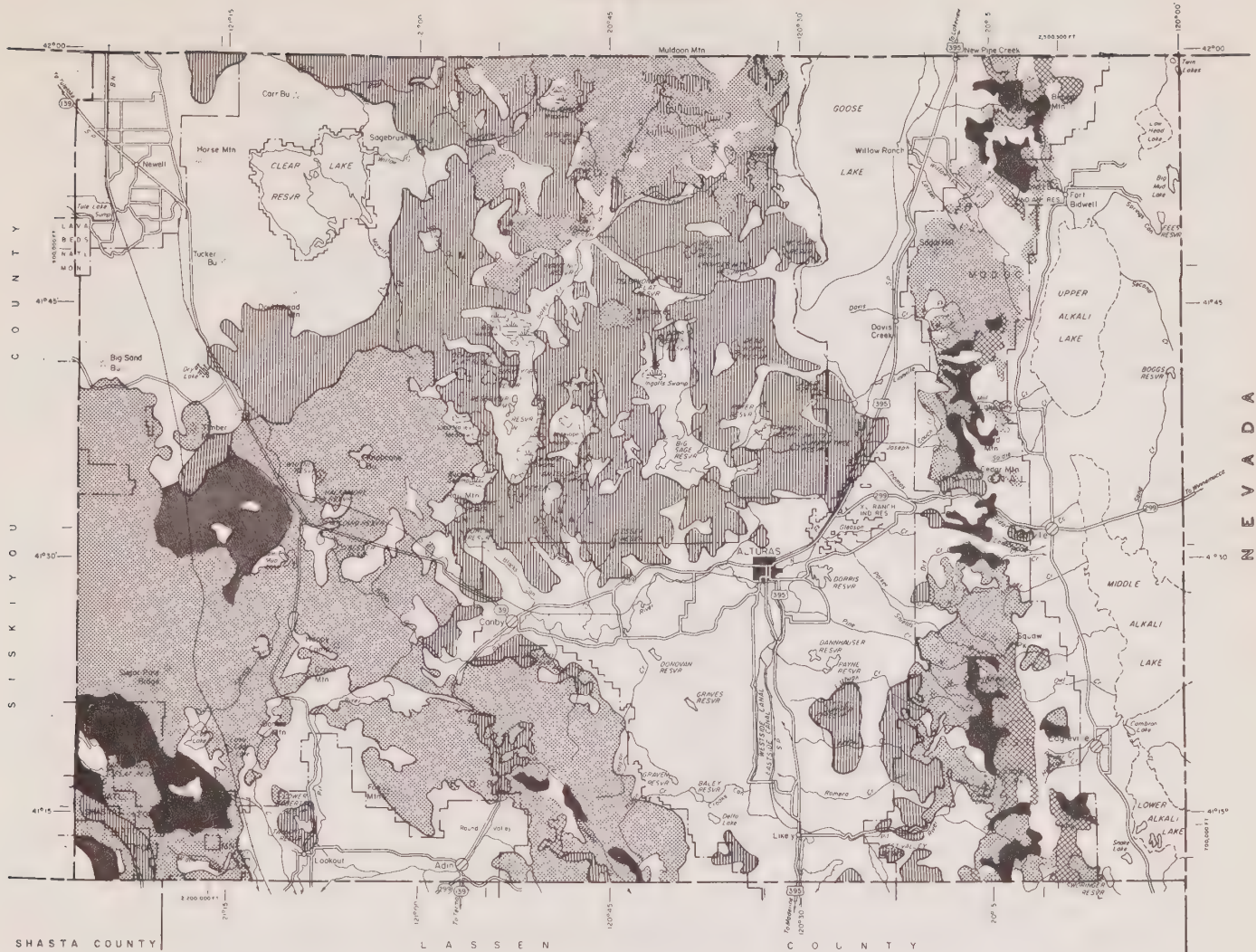
The commercial forest land in Modoc County is generally relatively slow growing compared to the west side of the Sierras and very low compared to the coastal areas. Roughly in terms of board feet, this is 150 board feet per acre per year compared to the west side figure of 300 plus and the coastal figure of 500 plus.

The principal species which are harvested commercially in terms of importance in Modoc County are:

- Ponderosa pine - *Pinus ponderosa*
- White fir - *Abies concolor*
- Shasta red fir - *Abies magnifica* variety *Shastensis*
- Jeffrey pine - *Pinus Jeffrey*
- Lodgepole pine - *Pinus contorta*
- Western white pine - *Pinus monticola*
- Incense-cedar - *Libocedrus decurrens*
- Sugar pine - *Pinus lambertiana*
- Mountain hemlock - *Tsuga mertensiana*

^{1/} One basis of defining commercial forest land is whether it is capable of growing 20 cubic feet of wood per acre per year.

^{2/} California Division of Forestry

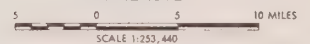


MAJOR TIMBER SPECIES

-  Pine
-  Juniper
-  White Fir
-  Lodge Pole Pine
-  Pine (non-commercial)

MAJOR TIMBER SPECIES
MODOC COUNTY
CALIFORNIA

APRIL 1972



Data from California Division of Forestry

The major hardwoods which are not harvested commercially in the county include:

Quaking aspen - *Populus tremuloides*
California black oak - *Quercus kelloggii*
Black cottonwood - *Populus trichocarpa*
Mountain mahogany - *Cercocarpus ledifolius*

The only major noncommercial conifer is western juniper - *Juniperus occidentalis* - which covers much of the county and is used only for posts and firewood.

Generally, the juniper occupies the poorer sites with the lowest rainfall, then the pine, with the white fir at the higher elevations with red fir and lodgepole pine the farthest up the range. The map following page 104 shows the general distribution of the major timber species.

DISCUSSION

County-Wide Issues:

1. Privately owned commercial forest lands show the greatest range of management. Some lands are held purely for speculation, with the idea of subdividing into smaller parcels as recreational home sites. Some timberland is part of a larger rangeland holding. Some individuals and several companies look to their timberland as their primary source of income and manage their lands accordingly. In Modoc County 83 percent of the commercial forest land is owned by the Forest Service or large private companies. Thus it is unlikely that the acreage of commercial timberland will decline significantly in the future.

Recommendations:

1. Classify and preserve public and private lands which are prime timber lands and reserve them for that use, while at the same time encouraging compatible recreation and open space uses.
2. Identify areas of unique value in their natural state, for purposes of educational, scientific, and aesthetic uses, and plan and program for their conservation. For example, locate the northernmost occurrence of the rare Washoe pine - *Pinus washoensis* - and reserve it.
3. Identify important wildlife habitat areas and provide for compatible uses within those areas.

TOURISM

Tourism in Modoc County has shown such a large yearly increase during the period 1967 through 1973 that it is rated as the third largest industry in the county. This has been documented by the increase of occupancy of county and Forest Service campgrounds, increase in the amount of hotel/motel tax funneled into the general funds of both the City of Alturas and Modoc County governments, steady but healthy growth of taxable retail sales reported by the California State Franchise Tax Board and the visitor registers maintained at the Modoc County Museum and the office of the Modoc County Chamber of Commerce. Upland game and waterfowl hunters, which have shown a

steady increase, are not included in the tourism category.

The increase of tourism in Modoc County can be attributed to several circumstances that exist in central and southern parts of the State of California which are the prime market areas for tourism in this area. Heavy congestion of population and vehicular traffic has motivated residents in those areas to search out a place to vacation where they can, in their terminology, "get away from the rat race" and find serenity, solitude and a place where they can communicate with nature. Smog and other unfavorable conditions are also motivating factors in causing these vacationers to seek a place in the high country. The expanded manufacture of roomier and vastly improved recreational vehicles, self contained and comfortable in every respect, has enticed the wandering owners to leave the main travel arteries of express and freeways to schedule their leisure time on the back roads and by-ways of the state.

Modoc County is endowed with the natural resources in the form of scenic campgrounds, natural forest, lakes, streams and reservoirs, excellent fishing, hunting, hiking trails and clean fresh air which are appealing incentives to visit the area. Vacation expense is another important factor that induces the vacationing family to select this area. Most all of the campgrounds are on a no-fee operation so the only cost (while in Modoc) is food and other necessities. So called "tourist traps" such as Lake Tahoe, Disneyland and others are prohibitively expensive for a family.

Tourism and outdoor recreational use should be promoted in an accelerated manner due to its overall input into the local economy. Such an industry is "clean" in that it does not overtax the services supplied by the county such as law enforcement, utilities, schools, etc. It is possible that such accelerated promotion could result in tourism taking its place on an equal basis with lumber and agriculture.

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MEMBERS OF TECHNICAL ADVISORY COMMITTEE:

Chairman -----	Mr. Michael Kaufman Modoc County Planner
Adin-Lookout Resource Conservation District -----	Mrs. Marian Duncan Secretary
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Modoc County Assessor -----	Mr. Frank Lew Modoc County Assessor
California Department of Fish and Game -----	Mr. Douglas J. Thayer Asst. Wildlife Manager Biologist Mr. Vern King Fisheries Biologist
California Division of Forestry -----	Mr. Earl Roberts Alturas Mr. Brian Barrette Sacramento
California Department of Water Resources -----	Mr. Albert J. Dolcini Red Bluff Mr. Bob McGill Red Bluff
North Cal-Neva Resource Conservation and Development Project -----	Mr. Walter O. Husa Chairman Mr. James Linebaugh Coordinator
United States Bureau of Land Management -----	Mr. Dean Bibles District Manager Susanville



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United States Forest Service -----	Mr. Hal McElroy Lands Officer, Alturas Mr. Frank VanWerkhoven Landscape Architect, Alturas Mr. George Gleason District Ranger, Cedarville Mr. Charles Goughnour District Ranger, Canby Mr. George Harper District Ranger, Adin Mr. Ben Casad District Ranger, Tulalake
United States Soil Conservation Service -----	Mr. Richard Pyle District Conservationist Alturas Mr. Steve J. Leonardo Engineer, Bieber Mr. Lester A. McKenzie District Conservationist Cedarville Mr. Norman C. McGourty District Conservationist Tulalake

OTHERS:

Modoc County Chamber of Commerce, Jim Hendricks, Manager
 Modoc County Record, Bob Sloss, Editor
 Bureau of Reclamation, Klamath Falls
 California Department of Fish and Game, Redding
 California Division of Forestry, Susanville
 Tulalake Irrigation District, Tulalake
 Soil Conservation Service, Red Bluff
 Soil Conservation Service, Portland

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